The Automobile

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NEW YORK, MARCH 2, 1916

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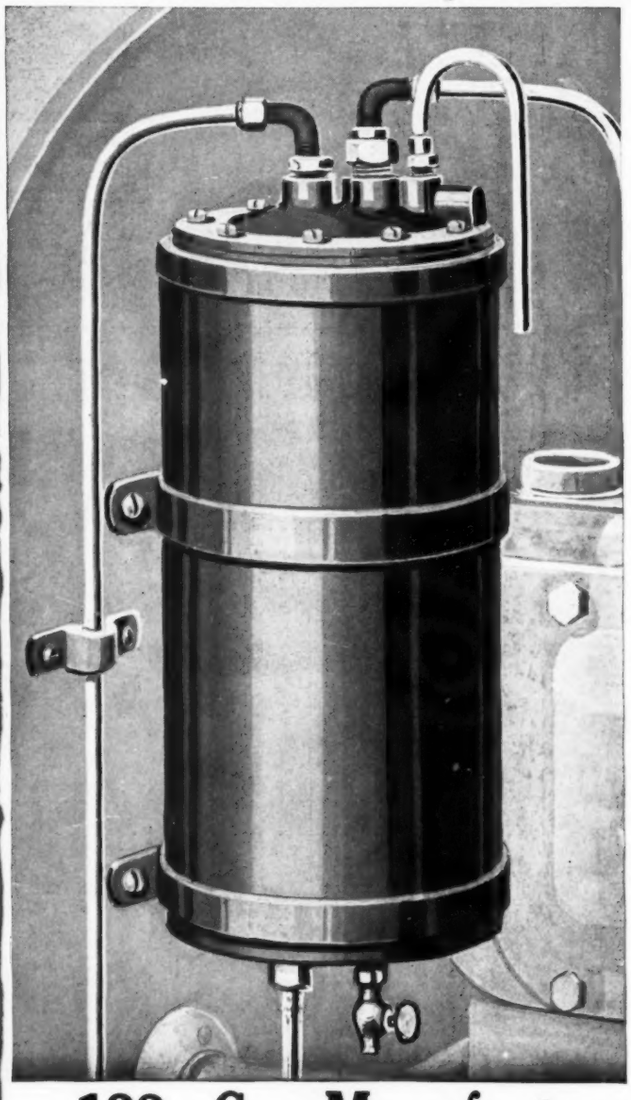

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122 Car Manufacturers now Equip

their entire output with the Stewart Vacuum System. Dealers are installing it on thousands of old cars, bringing them up-to-date. It's a whirlwind business for dealers and garages.

Stewart Vacuum System

Stewart-Warner Speedometer Corporation, Chicago, U. S. A.

VOL. XXXIV NEW YORK—THURSDAY, MARCH 2, 1916—CHICAGO No. 9

The AUTOMOBILE

New England

World's Greatest Department Store

¶ Her Machines Are Used in All the Factories of the World—Her Aid Is Given in Clothing All Nations—Her Leather Industry Is International—Agriculture and Lumbering Are Factors.

¶ Her Buying Capacity, Always Large, Is To-day at Full Tide—Her Factories Are Working Ceaselessly—Never Was Her Prosperity Greater Nor Her Prospects Brighter.

¶ Her Automobiles Have Gained 27 Per Cent in the Past Year—Her Purchasing Capacity Exceeds a Third of America's Automobile Output—She Has $500,000,000 of Unexpected Wealth.

NEW ENGLAND is the greatest department store of the world. Alone and unaided she can supply almost everything that civilized man desires or needs, and all she asks is the rawest of raw material in return. Feed New England with steel, with cotton and with hides and she will feed, clothe and equip you for any enterprise.

To-day New England boasts a territory roughly 3 per cent of the whole of the United States, but that area contains 7 per cent of the population. The six New England States together cover less ground than is included in each of eight single States in the Union. Texas, two and one-half times as large as all New England, has but a little more than half the population; Oregon, the same size as the six States, has but a tenth the number of people.

The Universal Provider

When first opened up the vast richness of the central and Pacific States dazzled for a time, but the development of the newer lands began around New England, and the pioneer districts looked always to New England to supply the goods of civilization that are the essentials of the creators of new communities. New England has been called the tool room of the world, and not inaptly; but let it not be forgotten that it was also the nucleus, the storehouse and the base for all Northern America; that there is no State in the Union and no country on the globe that does not still depend upon New England for many of the necessaries of life.

Ever Growing Prosperity

Like all other places, New England had its lean years and its fat ones, but through all of these a steady growth in population and a steady increase in individual wealth has been apparent. Does a new manufacturing industry arise, it is New England that exploits it and, though none too favored by climate, New England remains a great farming country.

Were some vast cataclysm of nature to remove these six fertile States, fertile of men and machines as well as crops, and two-thirds of the world would perforce go unshod, while countless thousands would be forced to garb themselves in something nearer the primeval style than cotton fabrics or woolen cloths. Halt the machine tool factories for a year and there is no manufactured thing throughout the world that would not rise in price. Flood the forests of Maine and Vermont and we should

see some interference with the wood pulp and the paper trade.

Five Primary Industries

There are in New England five great industries, the primary five they might be called. Firstly comes the bodily equipment of man, textile products, both woolen and cotton. Secondly is the leather trade, which makes a large proportion of the boots and shoes of the world. Thirdly, in normal times, are the tools with which civilized man earns his living, either the actual implements as are used by the mechanic or machines which are an intermediate stage in the fashioning of other tools. Fourthly comes produce of the soil. A little grain, a little fruit, many potatoes, together with much of man's simplest luxury, tobacco. Fifthly is lumber, mostly in the form of wood pulp for paper making.

The five primary products of New England thus might be classified as modern man's four chief necessities, clothes, tools, food and the raw material of intercommunication between man and man.

Numerous Small Industries

New England has a host of smaller products which are important in the aggregate. Marble and building stone come from the quarries of Vermont. From the Atlantic coast the inland gets the fish trawled for on the Grand Banks. Technical and educational books are another important product, even education itself, if you can call education a product of industry. Jewelry, watches, toys and an everlasting list of lesser things make up the vast total of civilization's complex necessities.

This is why New England is the main department store of the world.

Prosperity Grows Steadily

It is agreed that never has New England seen such prosperity as in the past twelve months. Naturally, a place that supplies so large a proportion of the world's necessaries must perforce be prosperous when the world's demand is large, but to turn that obvious prosperity into dollars and cents is not easy.

In 1910 the national census gave some idea as to the relative positions occupied by the different sources of New England wealth. It showed that the textile industry was about twice as productive as the leather trade, that machines and metallic products about tied with boots and shoes; that farming was the third most important activity of the six States. Putting figures of merit against the different sources of new England wealth the census showed somewhat as follows:

Textiles	6.25
Boots and shoes	2.93
Metal products—machines and tools	2.85
Farming	1.41
Lumber (mostly wood pulp)	0.83

Now the figures from which these deductions were made are not collected every year. Actually it is for farming alone that definite government returns are made. It might be thought that in six years there would not have been much development in the oldest art of civilization, yet comparisons show that the value of farm products in New England for 1915 is more than one and a half times as much as it was in 1910. To be exact, in the proportion of 2.17 to 1.41.

This is because both output and price show a rise, the New England farmers are getting more from the land and are obtaining a higher price in the market.

Factories Never Stop

In textile work and in the leather trades we see in 1915 a condition never before equalled. Instead of working on a normal ten-hour-a-day schedule, a majority of the plants have been in practically continuous operation. Doubled and more than doubled outputs are to be found everywhere. There has been no stocktaking; there has been no time for it, but to estimate that the earning power of the industries is double what it was in 1910 is conservative.

Vast Rise in Metal Products

What then of the metal trades? The imagination is almost staggered by the vastness of the increase. Not a plant but is running day and night and Sundays; not a plant but has increased its hourly output; not a plant but is employing more men over and above those needed for the extra shifts. In Rhode Island alone it is agreed by the authorities that $120,000,000 is altogether too small a sum properly to represent the *increase* in the earnings of capital and labor. Massachusetts reckons about an equal sum and Connecticut a larger amount. Say these three States have, by their manufactures alone, earned $400,000,000 more in 1915 than is their normal, and one is still well on the safe side.

The accurate statistics of agriculture in the six States of New England show increased earnings totalling $53,000,000. Lumber has gained a little, while the factories of Maine, Vermont and New Hampshire, smaller in importance though they be, have none the less been swamped with business.

More Than $500,000,000

Five hundred million dollars is altogether too small a sum properly to represent the *extra* money New England has earned from the rest of the world in 1915.

Of course the population of the six States has increased also. Taking the normal rate of increase and adding a little to allow for the influx of workers in the past twelve months, we arrive at a figure of about 7,000,000 men, women and children. The normal per capita wealth of the inhabitants of the United States was just over $1,300 in 1914. Ten years before it was about $1,200, so the normal rate of increase is not more than $10 per annum. Spreading the extra $500,000,000 New England earned last year over her 7,000,000 population and we get a per capita increase of over $70; seven times the normal increase for a year. Further-

more, it may be remembered that this increase is not properly spread over a whole year. Many of the New England factories were rushed with work a year ago, but not all of them by any means, and there was a noticeable increase in the pressure during the summer, so it is fair to estimate that New England has, during 1915, raised her per capita wealth 750 per cent of the normal yearly rise.

High Per Capita Wealth

Take it another way and, regarding the per capita increase as a percentage of the normal per-capita wealth, we see that there has been a very large rise. Of course the New Englander is better off always than the average for the whole country, so let us assume that the per capita wealth of New England was $1,500 in 1914. Add $75 to $1,500 and we get a 5 per cent increase in capital value of each inhabitant, a pretty substantial rise for twelve months.

Prosperity Not Due to War

Ask almost any man, and he will answer that the prosperity of New England is undoubtedly enormous, and, he will add, due to war orders. This popular view is not wholly correct, for although New England is making munitions and supplies of one sort and another for troops; these war orders have not made the immense difference in the state of New England's business which actually exists.

Europe Ceases Exportation

The true way to regard the prosperity of New England's factories is to recall the fact that *Europe has ceased to export.* Thus we find many markets formerly supplied from England, from France or from Germany turning to America for their supplies. It is a very striking fact indeed that so many of the New England factories report the possession of good contracts with various of the South American republics. In a great number of instances the manufacturers report that they have secured very desirable customers in this way, that the present orders from this source are keeping them very busy and that the quality of the goods is being appreciated so greatly that the foreigners will have a very hard struggle to get back in the market again in the future.

America Takes Bulk of Output

Then, too, the demand upon America to generally look after and care for the world while the rest of it fights has brought prosperity to the whole of the United States, so that the domestic trade of New England is booming. In the automobile industry the demand for tools and plant equipment has been unprecedented; building, which has shown immense activity the past few months, demands all sorts of the smaller New England metallic products, and so the argument can be extended. Take away from New England all her munition orders, all her orders for clothes and boots for the armies, and she would still be very busy indeed.

What does this prosperity mean to the automobile trade? It means that the buying capacity of New England is far greater than ever before. Here is 96,000 square miles of territory with 7,000,000 inhabitants and $500,000,000 *extra* to spend or to invest: $500,000,000 unexpected money which will be expended somewhere.

Could Buy a Third of Automobile Output

It is estimated that the value of the automobiles to be made in America this year will be $1,300,000,000, so New England could, if she wished, buy about 38 per cent of the whole with the money already earned to say nothing of the money now being earned at an even faster rate than prevailed throughout 1915. To estimate how much New England actually will spend upon cars is impossible, but if she puts aside 20 per cent, $100,000,000, for this purpose it will take the automobile manufacturers all their time to fill even a part of the demand.

A long ago idea of what the automobile should be.—An advertisement in "The Motor Vehicle Review" of 1899.

New England Registrations Total 185,363 Cars and Trucks

39,331 More in Use in That Territory Than at the Close of 1914—38 People Per Car—20,804 Commercial Vehicles—2812 Dealers, Garages, Etc.

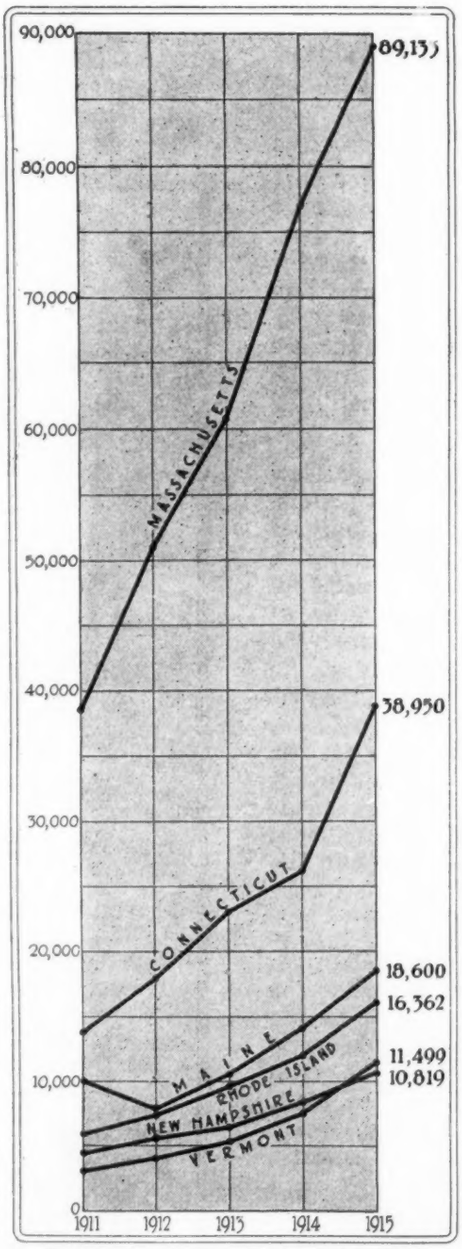
By Donald McLeod Lay

REGISTRATION statistics for the calendar year 1915 indicate that the six New England States, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut, are all still far from the saturation point as regards their capacity to purchase automobiles and motor trucks. The average population-to-car ratio for this group of States is 38 to 1, or slightly higher than the average ratio for the entire country, which is 42 to 1. Of all the States, Iowa holds premier position in population-to-car ratio with a 16 to 1 proportion. The highest New England ratio is 32 to 1, Connecticut and Vermont both attaining this relation and Rhode Island having 37 to 1. Maine, Massachusetts and New Hampshire each have 41 to 1.

A Big Field

It is readily seen that Iowa's ratio is the logical mark at which New England should aim, although her rich agricultural acres enhance the car-buying capacity of this State to a degree that New England, with its large areas of untillable mountain country and unproductive lakes, perhaps can never attain. A comparison of what Iowa and the New England group have accomplished, however, brings out very strongly the latent possibilities in New England as a field for the automobile and motor truck manufacturer and dealer.

If New England, with a population of 7,108,003 on Jan. 1, 1916, had one motor vehicle for every sixteen persons, as is the case in Iowa, she would have a total of 444,250 cars and trucks. In other words, with her total registration of 185,363 at the end of 1915, she has yet to buy 258,887 machines to be on a par with Iowa in respect to population-to-car ratio. Of the total of 185,363 registrations at the end of 1915, there were 20,804 motor trucks of various sizes and types.



Registration in New England since 1911

But, although yet far from the population-to-car ratio of a number of other States, the New England group made very substantial gains in registration during 1915, the number of cars and trucks added to their records during the year being 39,331, or a gain of 26.9 per cent. As compared with the first reliable statistics available, the registration reports for 1911, the latest figures show a gain of 108,875 cars and trucks during the five years, or 142 per cent, since the 1911 total was only 76,488.

Massachusetts, which holds eleventh place in the list of forty-eight States and the District of Columbia, leads the rest of the New England group in total registrations, with 89,133, a gain of 12,301 vehicles, or 16 per cent over 1914.

Connecticut's Increase Large

The remaining five States are much smaller in registration, Connecticut, with 38,950 vehicles, adding 12,732, or more than Massachusetts gained during the year, being 49 per cent over Connecticut's 1914 total.

Maine ranks third with 18,600, a gain of 4300 machines, or 30 per cent.

Rhode Island is fourth with a total of 16,362, an increase of 4031, or 33 per cent over 1914.

Vermont is fifth with 11,499 cars and trucks, a gain of 3886, or 51 per cent, the highest percentage gain of the New England States.

Last, but not far behind, comes New Hampshire with its total of 10,819, representing 2081, or 24 per cent, more cars and trucks than in 1914.

Studying the registration statistics, we find a steady, consistent growth recorded from year to year in the New England States, the total for 1912 being 94,434 cars and trucks in use there as contrasted with the 76,488 reported at the end of 1911. The following year 22,969 more people bought cars or trucks, pushing the registration total up to 117,403, and in 1914 this increased to 146,032, in 1915 reaching an aggregate of 185,363. It will be seen from a comparison of the yearly increases in the number of registrations that these grew larger almost in

direct proportion year by year, and it is also evident that the increases of the individual States have been usually in proportion to the total registration in each.

30 Manufacturers

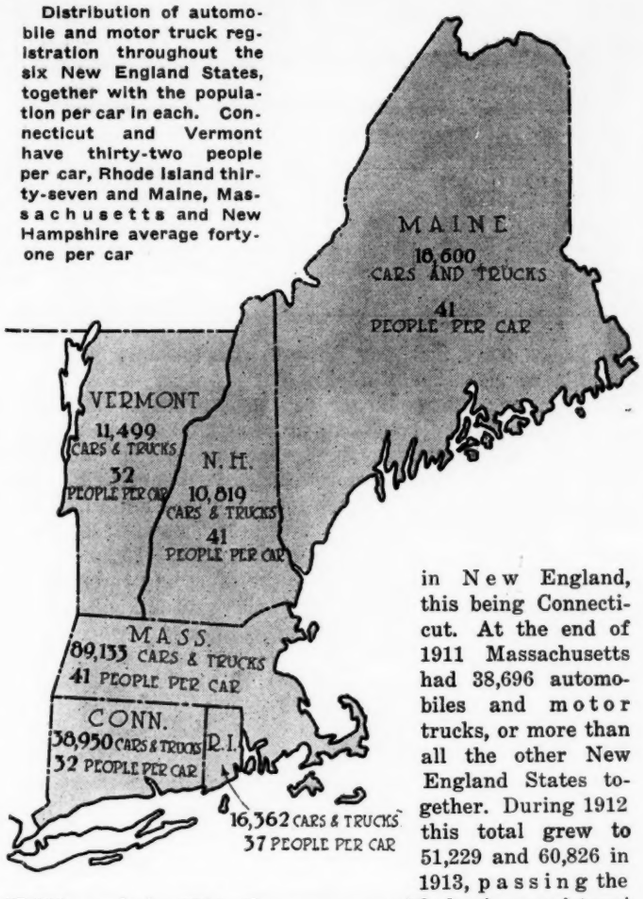
Industrial statistics show that there are thirty manufacturing establishments in three of the New England States, Massachusetts, Connecticut and Rhode Island, which are producing automobiles, commercial vehicles and motors. There are twelve car makers, fifteen truck builders and five motor manufacturers, several of these being included under more than one heading, which explains the apparent discrepancy in the total.

2812 Dealers, Garages, Etc.

Similarly, there are 2812 automobile establishments in New England besides the manufacturing plants mentioned. Of these, dealers are represented to the extent of 1349, garages constitute 1580, repair shops 658, supply dealers 122 and charging stations 133. The same explanation as that given in the preceding paragraph serves to reconcile these figures with the total.

There are nearly 10,000 commercial motor vehicles in the Bay State, which has over twice as many as its nearest rival in New England, this being Connecticut. At the end of 1911 Massachusetts had 38,696 automobiles and motor trucks, or more than all the other New England States together. During 1912 this total grew to 51,229 and 60,826 in 1913, passing the 75,000 mark in 1914, the commonwealth having registered 76,832 motor vehicles. In the five years from 1911 to 1915, when 89,133 represented the total number of cars and trucks in the Bay State, 50,437 machines were added to its records. Illustrating the growing recognition of Massachusetts as a tourists' paradise, there were 13,500 non-resident car owners registered in the State in 1915 as compared with 7150 in 1914, only 920 in 1913 and 858 in 1912. Fees of various kinds paid by automobile and motor truck owners, dealers, chauffeurs, etc., passed the $1,000,000 mark last year, attaining a total of $1,205,420.19, as compared with $925,964.75 in 1914, a gain of $279,455.44.

Distribution of automobile and motor truck registration throughout the six New England States, together with the population per car in each. Connecticut and Vermont have thirty-two people per car, Rhode Island thirty-seven and Maine, Massachusetts and New Hampshire average forty-one per car



CAR AND TRUCK REGISTRATIONS IN THE NEW ENGLAND STATES SINCE 1911 WITH DUPLICATES ELIMINATED

State	1911	1912	1913	1914	1915	Gain in Five-Yr. Period
Connecticut	13,994	17,950	23,263	26,218	38,950	24,956
Maine	10,045	7,743	10,570	14,300	18,600	8,555
Massachusetts	38,696	51,229	60,826	76,832	89,133	50,437
New Hampshire	4,489	5,764	7,420	8,738	10,819	6,330
Rhode Island	6,017	7,565	9,894	12,331	16,362	10,345
Vermont	3,247	4,183	5,430	7,613	11,499	8,252
Total	76,488	94,434	117,403	146,032	185,363	108,875

1914 AND 1915 CAR AND TRUCK REGISTRATION IN NEW ENGLAND WITH INCREASES

State	1915 Reg.	1914 Reg.	Car Increase	Per Cent. Increase
Connecticut	38,950	26,218	12,732	49
Maine	18,600	14,300	4,300	30
Massachusetts	89,133	76,832	12,301	16
New Hampshire	10,819	8,738	2,081	24
Rhode Island	16,362	12,331	4,031	33
Vermont	11,499	7,613	3,886	51
Total	185,363	146,032	39,331	
Average per cent. increase				26.9

POPULATION PER CAR IN THE NEW ENGLAND STATES

State	Cars Registered	Population Jan. 1,1916	Pop. Per Car
Connecticut	38,950	1,234,031	32
Maine	18,600	770,064	41
Massachusetts	89,133	3,690,748	41
New Hampshire	10,819	441,545	41
Rhode Island	16,362	608,540	37
Vermont	11,499	363,075	32
Total	185,363	7,108,003	
Average population per car			38.3

CAR, TRUCK AND MOTOR MANUFACTURERS IN NEW ENGLAND

State	Car Makers	Truck Builders	Motor Mfrs.	Total
Connecticut	5	4	2	9
Massachusetts	7	10	2	19
Rhode Island	..	1	1	2
Total	12	15	5	30

NUMBER OF DEALERS, GARAGES, REPAIR SHOPS, SUPPLY DEALERS AND CHARGING STATIONS IN NEW ENGLAND

State	Dealers	Garages	Repair Shops	Supply Dealers	Charging Stations	Total
Connecticut	287	220	120	33	22	527
Maine	115	217	62	5	14	354
Massachusetts	582	724	276	66	74	1,258
New Hampshire	159	184	76	3	11	267
Rhode Island	85	110	70	11	9	209
Vermont	121	125	54	4	3	197
Total	1,349	1,580	658	122	133	2,812

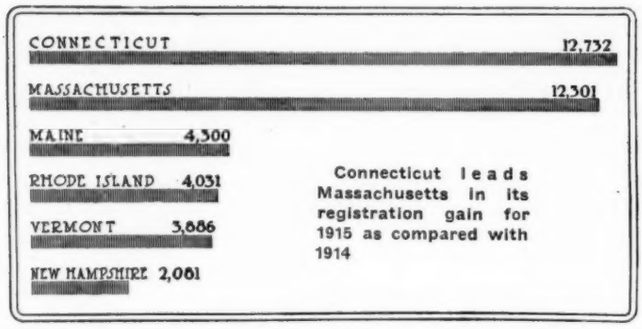
Massachusetts Still Leads

Accepting the latest census bureau estimate of 3,690,748 as the population of Massachusetts at the beginning of 1916, the Bay State has forty-one persons for each car and truck registered, allowing for all duplication.

Of great importance in the pioneer days of the automobile industry as the home of many manufacturing activities, Massachusetts is still a factor, having seven automobile establishments, ten motor truck plants and two motor manufacturers, according to *The Automobile Trade Directory*. In addition, a considerable percentage of the leading accessory manufacturers are located in this State.

Massachusetts has 1258 dealers, garages, repair shops, supply dealers and charging stations, there being 582 dealers' establishments, over twice as many as in Connecticut, which is in turn far ahead of the other New England States. The Bay State's total of 724 garages is nearly as many as all the others combined, while its 267 repair shops, sixty-six supply dealers and seventy-four charging stations are in each instance more than twice as many as any of the other States in the group can boast.

Connecticut registered 38,950 cars and trucks in 1915, or



over 20,000 more than any State in this territory with the exception of Massachusetts.

The Nutmeg State's increase in registration during 1915 was 12,732 cars and trucks, or 49 per cent, being 431 more than that of Massachusetts during the same period. In 1911 there were only 13,994 motor vehicles in Connecticut, this number increasing to 17,950 the following year and to 23,263 in 1913. At the end of 1914 the records showed 26,218 machines in use, the increase in registration for 1915 being 508 more than the gains made during the preceding three years combined. As compared with 1911, the 1915 statistics show an increase of 24,956 cars and trucks.

In respect to the number of trucks registered Connecticut is far ahead of all the other New England States except Massachusetts, having nearly 5000 in use.

Has Nine Manufacturers

Crediting Connecticut with 1,234,031 population, there are thirty-two persons to each car or truck in the State, this being the lowest number being shown by any of the New England States, an honor which is shared with Vermont. No statistics are available in regard to non-resident registrations in Connecticut.

There are five automobile manufacturers located in the Nutmeg State, which also has four motor truck builders and two motor manufacturers, although the total for the State is only nine, owing to the fact that some establishments are counted under more than one heading. There are 527 establishments in Connecticut included under the classifications of dealers, garages, repair shops, supply dealers and charging stations. This total is made up of 287 dealers, 220 garages, 120 repair shops, 33 supply dealers and 22 charging stations, many of these being counted under two or more heads so that they apparently do not agree with the total.

Connecticut's fees increased $136,619.85 in 1915, the amount received being $544,625.81, as compared with $408,005.96 in 1914.

Maine in Third Place

Maine's increase of 4300 cars and trucks in 1915 was 269 greater than the gain of 4031 made by Rhode Island. Thus Maine shows a 30 per cent increase in registration as compared with the 1914 total of 14,300, while on its estimated population of 770,064 for Jan. 1, 1916, it has a population-to-car ratio of 41. Of the total registration approximately 1000 are commercial vehicles. Maine's fees for 1915 were $13,865.12 less than those of New Hampshire, amounting to $268,412 as compared with $282,277.12. Yet the gain over the 1914 receipts of Maine's registration office was $112,726, or over 72 per cent.

In 1911 Maine's total registration was 10,045. In 1912 a new law went into effect shortly before the automobile census was made so that there were only a part of the cars in the

1915 Massachusetts Registrations Analyzed by Makes

Ford	25,961	American	190	Koehler	47	Easton	18	Staver	9
Buick	7,919	Anderson	182	Herreshoff	46	Hotchkiss	18	Words	9
Cadillac	5,812	Fiat	182	Lexington	46	Amer. Cyclecar	17	Krebs	8
Overland	5,122	King	176	Marquette	44	Elkhart	17	Milburn	8
Studebaker	3,570	Krit	174	Babcock	43	Lion	17	Signal	8
Maxwell	3,386	Abbott	171	Paterson	43	Pilot	17	Sternberg	8
Hudson	3,119	Chase	169	Bergdoll	42	Benz	16	Tait Bros.	8
Packard	3,102	Kelly	168	Ohio	41	Crow	16	Bessemer	7
Chalmers	2,495	G. M. C.	168	S. G. V.	41	Pickard	16	Buffum	7
Metz	2,031	Simplex	162	Ward	41	Reliance	16	Carhartt	7
Reo	2,005	Federal	154	Daimler	41	Commercial	15	Grabowsky	7
Pierce-Arrow	1,794	Stewart	141	Buckeye	39	Cunningham	15	Lear	7
Stevens	1,596	Warren	132	Motorcar	39	Cutting	15	Saurer	7
Oakland	1,209	Baker	123	U. S.	39	Mercury	15	Steele	7
Jeffery	1,180	Garford	123	Republic	38	New Eng. Truck	15	Walter	7
White	1,129	Little	122	Napier	36	Rainier	15	Bay State	6
Hupp	1,074	Pullman	117	Welch	35	Vulcan	15	Buffalo	6
Pope	1,061	Speedwell	113	Flanders	34	Gear	14	C. G. V.	6
Stanley	1,009	Marion	111	Nyberg	34	Grand Rapids	14	Couple Gear	6
Peerless	962	Bailey	109	Walker	34	Henry	14	Croxton	6
Dodge	942	Imperial	108	Adams	33	United	14	Davis	6
Chevrolet	914	Atlas	104	Johnson	33	Victor	14	De Luxe	6
Franklin	862	Case	104	Clark-Carter	32	Alma	13	Driggs-Seabury	6
Autocar	754	Scripps-Booth	98	Cameron	31	Herff-Brooks	13	Harwood	6
E. M. F.	723	Renault	97	Sears	31	Mercedes	13	Hercules	6
Jackson	708	Moon	96	Mais	30	Monroe	13	Imp	6
Oldsmobile	700	Apperson	94	McFarlan	30	Brown	12	Keystone	6
Regal	695	Michigan	92	Allen	29	Chadwick	12	Middleby	6
Winton	683	Everitt	92	Eldridge	29	Knight	12	Morse	6
Knox	653	Trumbull	92	Gramm	29	Postal Trans. Serv.	12	Otto	6
Mitchell	615	Grout	85	Penn	29	Royce	12	Service	6
Paige	603	Mack	84	De Tamble	28	Teele	12	St. Louis	6
Stearns	584	Cartercar	83	Courier	27	Flint	11	Whiting	6
Dayton	565	Ideal	83	L. P. C.	27	Kline	11	York	6
Locomobile	546	Brush	81	McIntyre	27	Maccar	11	Bayard	5
Velie	491	Touraine	81	Schacht	27	Northern	11	Blomstrom	5
Saxon	447	Waverley	79	Dart	26	Panhard	11	Brightwood	5
Cole	425	R. & L.	77	Parry	26	Rochet-Schneider	11	Colum. Buggy	5
International	392	Crawford	75	Standard	26	Waltham	11	Dragon	5
Chandler	378	Grant	75	Little Giant	24	Wayne	11	Frayer	5
Premier	345	Palmer-Singer	72	Columbus	24	Darracq	10	Howard	5
Kissel	338	Sampson	66	Lancia	24	Delauney	10	Midland	5
National	280	Westcott	65	Lyons	23	Havers	10	Sullivan	5
Lozier	276	Universal	64	Palmer-Moore	23	Lambert	10	Sultan	5
Marmon	273	Elec. Veh.	63	Acme	22	Lansden	10	Vanderwater	5
G. V.	249	Henderson	62	Voiturette	22	New Departure	10		
Lenox	248	Marathon	61	De Dion	22	Norwalk	10	**Miscellaneous**	
Haynes	242	Berkshire	59	Westfield	22	Partin	10	29 mfrs. each 4	116
R. C. H.	234	Empire	59	Dort	21	Austin	9	31 mfrs. each 3	93
Locomobile	219	Atterbury	58	Mora	21	Consolidated	9	70 mfrs. each 2	140
Mercer	217	Briscoe	58	Moyer	21	Gesellschaft	9	272 mfrs. each 1	272
Stutz	214	Lauth-Juergens	55	Rapid	21	Harrison	9	Total	101,500*
Thomas	213	Corbin	54	Fuller	20	Isotta	9		
Elmore	208	Mathewson	54	Morgan	20	Owen	9		
Inter-State	194	Royal	53	Detroit	19	Pathfinder	9		
Selden	194	Auburn	49	Commerce	18	Pittsburgh	9		
Columbia	193	Briggs	47	Decatur	18	Sanford	9		

*Does not tally with other statistics, as it includes non-resident and re-registrations.

NON-RESIDENT REGISTRATION IN NEW ENGLAND STATES SINCE 1912

State	1912*	1913	1914	1915
Connecticut	**	**	**	**
Maine	400	**	700	2,000
Massachusetts	858	920	7,150	13,500
New Hampshire	750	16	1,160	1,466
Rhode Island	1,000	288	**	**
Vermont	100	448	643	**
Total	3,108	1,672	9,653	16,966

*Includes re-registration. These are not included in other years.
**No record.

State on record. The 10,570 machines reported for 1913 seem to credit the State with only a small gain but it must be remembered that the 1911 figures include numerous duplicate registrations, no record of these being available at that time. In 1914 Maine's total had reached 14,300 and by the end of 1915 it was 18,600, a gain of 8555 in five years.

Maine has no manufacturers of automobiles, motor trucks, or motors, but it boasts of 354 dealers, garages, repair shops, supply dealers and charging stations. There are 115 dealers, only a few less than Vermont and a few more than Rhode Island, but the 217 garages rank Maine close behind Connecticut. There are sixty-two repair shops, five supply dealers and fourteen charging stations.

Rhode Island Ranks Fourth

On a population basis of 608,540 Rhode Island, the smallest State in the country, has thirty-seven persons to each motor vehicle. Of the total registration, over 1500 are motor trucks while the fees received by the registration department last year were $208,498, an increase of $51,478 over the $157,020 taken in during 1914.

The number of motor vehicles in Rhode Island has increased almost proportionately each year, varying from 6017 in 1911 and 7565 the following year to 9894 in 1913, growing to 12,331 in 1914 and again to 16,362 last year, the total increase for the five years being 10,345 cars and trucks, or nearly 200 per cent as compared with the 1911 registration total.

Although there are no automobile manufacturers in Rhode Island, this State is the home of one motor truck maker and one motor-manufacturing concern. There are only 209 dealers, garages and similar establishments, this total being smaller than that of any of the other New England States except Vermont which has 197. In so small a territory naturally comparatively few dealers are required, there being eighty-five in the State. Garages number 110, there are seventy repair shops, eleven supply dealers and nine charging stations.

Vermont Stands Fifth

Although New Hampshire had 1242 more cars registered in 1911 than Vermont, in 1915 the latter State managed to forge to the front, its total of 11,499 cars and trucks being 680 in excess of the 10,819 which New Hampshire was able to muster. Vermont's increase over its 1914 total of 7613 was 3886, or 51 per cent, and on a population basis of 363,075 its population-to-car ratio was 32, this State sharing with Connecticut the place of honor in this respect among the New England group. Vermont's increase in motor vehicle registration during the five years from 1911 to 1915 was 8252, or over 200 per cent.

Few Trucks in Vermont

Only about 350 motor trucks are in use in Vermont and the receipts of the State motor vehicle registration department during 1915 amounted to $218,479.85, an increase of $64,212.94 as compared with $154,266.91 collected in the preceding year.

Like that of the other States, Vermont's annual gain in registrations has been fairly constant, the number of cars and trucks recorded each year varying from 3247 in 1911 and 4183 a year later, 5430 in 1913 and 7613 in 1914, to 11,499 last year.

There are no car, truck or motor manufacturing establishments in Vermont but there are 197 dealers, garages, etc., many of whom necessarily are counted more than once since they operate establishments requiring classification under more than one heading. Thus there are 121 dealers, 125 garages, fifty-four repair shops, four supply dealers and three charging stations.

New Hampshire in Sixth Position

Although ranking below Vermont on the basis of car and truck registrations in 1915, New Hampshire is only 680 behind, having 10,819 motor vehicles as compared with 8738 at the close of 1914, a gain of 2081 machines, or 24 per cent. Like Maine and Massachusetts, New Hampshire has forty-one persons for each car and truck registered, its population on Jan. 1, 1916, being estimated at 441,545. There are nearly 1000 commercial vehicles included among the registrations and fees for 1915, covering passenger cars, trucks, dealers, chauffeurs, etc., amounted to $282,277.12, or $82,274.62 over the 1914 total of $200,002.50.

In 1911 New Hampshire had 4489 motor vehicles, increasing to 5764 in 1912, and during the following year to 7420, the 1914 registration amounting to 8738 and the 1915 total to 10,819. Thus the increase for the five years since 1911 was 6330 cars and trucks, or over 100 per cent.

Dealers, garages, repair shops, etc., in New Hampshire number 267, there being 159 dealers, 184 garages, seventy-six repair shops, three supply dealers and eleven charging stations. It will be noted that all of these figures with the exception of the number of supply dealers are considerably in excess of those for Vermont, which has 680 more cars registered than New Hampshire.

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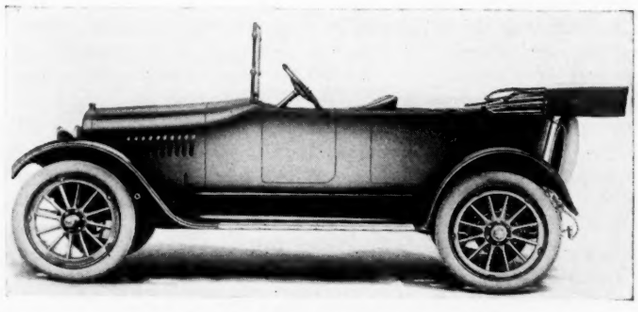
Dixie Flyer Is New Car

THE Louisville Automobile Show marked the first public appearance of the Dixie Flyer, made by the Dixie Motor Car Co. of this city. The new car is to sell for $775.

The Dixie Flyer has a four-cylinder unit power plant with floating rear axle and 112-in. wheelbase, using the Dyneto electric system. The body is a yacht type finished in bottle green, the high crowned fenders and radiators are black enameled and wheels are finished in a light natural wood stain.

The instrument board is covered with buffed leather and outlined with raised aluminum binding, the interior of the doors are covered with the same heavy grade of upholstering material as the cushions, and the floors and toe board are covered with deep piled carpet of a tan-olive shade blending into the general color scheme. It is close fitting and neatly and durably bound around the pedal and lever openings.

The Dixie Flyer is furnished with complete equipment, including one-man top, quick detachable side curtains, etc., and a full complement of tools.



Four-cylinder Dixie Flyer listing at $775

Lest We Forget

New England's Pioneers Did Much to Put the Industry Where It Is Today—Home of Mechanics Who Were Fascinated by Problems of Road Locomotion

IT is but natural that New England, the home of the best mechanics in the world, should have had its share in the development of the automobile industry. New England's entire atmosphere breeds accurate workmanship and mechanical virility which has been an influential factor in the development of more than one of the country's leading manufacturing arts.

The fascinating problems of motion, particularly as applied to self-propelled vehicles proved irresistible to New England's mechanical mind and in many a back yard, men, whose daily pursuits were in other fields, labored after hours and late into the night on vehicles which have left their stamp on the industry as it is to-day. Even at the time of the Civil War the experiments of Roper in and around Boston attracted attention and the story of Roper is the story of many others who helped to solve the big initial problems of the horseless carriage.

Here in the atmosphere of the forge and machine shop where the raw materials of the world are turned into finished products, the mechanical skill of men accustomed to the loom and machines of precision and complicated motion soon began to clear a way through the jungle of difficulties in the way of road locomotion. It was but natural then that steam, the best known motive power, should be first employed and the necessity for a light-weight steam vehicle soon brought to light developments which are important factors in steam plants to-day. For example James H. Bullard, Springfield, Mass., built in 1885 a cylindrical boiler with horizontal fire tubes.

Early Steam Vehicles

Fairly successful steam cars were constructed in New England as far back as 1893, when C. L. Simmonds, Lynn, Mass., had one operating in the streets, and in the years previous to 1898 the steam car of George E. Whitney, the forerunner of the Stanley, was a common sight in Charles River Park, Boston. Then later, when the internal combustion engine was developed to a higher point, men like C. E. Duryea, H. P. Maxim, H. W. Alden and others were not lacking to take up this phase and bring it rapidly to the front.

Automobile activity has shifted to the Middle West with Michigan and Indiana as our leading manufacturing States, and the part that New England played in the development of the motor car is apt to be forgotten. Memory should be refreshed of the giant's part borne by the country of the Pilgrims and the Puritans in building an industry which typifies modern science, because that part is immensely important in that many of the leaders of the industry to-day found their automobile engineering birthplace in New England.

The Electric Vehicle, Pope, Knox, Columbia, Duryea, and Locomobile companies have been the schools in which many of the automobile engineers of world-wide renown to-day received the experience and training which has made them preeminent. Some are still in New England, others have followed the trend toward the Middle West and are now established closer to the heart of the industry to-day, and yet there was a time when the little group of manufacturers in the six New England States included in their ranks a large percentage of the automobile engineers of this country.

Turn back to 1906: Ten years ago, the membership list of the Society of Automobile Engineers included eight New England engineers. These were H. W. Alden, Harry A. Knox, Hiram P. Maxim, W. J. P. Moore, B. Morgan, A. L. Riker, Henry Souther and A. C. Schultz. These pioneers, most of whom have made automobile history both in New England and in other parts of the country, are representative of the spirit of New England, a decade and more ago.

To-day the New England membership of the S. A. E. is 140, and since the society is growing steadily there is no doubt that this will increase annually, but now that the pioneers have cleared the way and put this giant industry in the position it occupies to-day, it is well that in giving honor to New England for the part it rendered in the early days, that credit also should be extended when the automobile had to combat the popular prejudice of the day, not to mention adverse legislature and adverse traction interests.

Beginnings of the Nineties

But far back of the first days of the history of the S. A. E. some of the pioneers mentioned were at work. H. W. Alden and Hiram Percy Maxim were associated in the American Projectile Co., and in the fall of 1894, when Mr. Maxim started experimenting in Lynn, Mass., with his three-cylinder tricycle, Mr. Alden was associated with him, making most of the drawings for the odd vehicle at night. This tricycle was run over the roads of Lynn and vicinity in 1895. Mr. Alden migrated soon afterward to the Pope Mfg. Co., Hartford, following Mr. Maxim, these two being associated with Hayden Eames in the opening of an experimental motor car department under the direction of the Pope Mfg. Co.

Mr. Alden went with the Electric Vehicle Co., Hartford, in 1902 and remained until 1905. This concern was another great developer of automobile engineers, having been the school in which more than one now well-known engineer received his early training in the automobile business. Mr. Alden remained with the Electric Vehicle Co. until June, 1905, and then returned to the Pope Mfg. Co., where he developed the commercial car department, building several trucks with two-cylinder, horizontal, opposed motors. In April, 1906, Mr. Alden left New England, the scene of his early endeavors, and went with the Timken company Detroit, where he has been ever since.

An 1896 Four-Cylinder

A story of New England automobile engineers cannot be told without mentioning Harry A. Knox, who in 1896, while attending the Springfield Industrial Institute, designed and built a four-cylinder-opposed, four-cycle, horizontal engine, and later in connection with A. H. Overman, president of the Overman Bicycle Co., Chicopee Falls, Mass., made arrangements to develop an automobile with this motor. The activities of Mr. Knox also extended to the Duryea Co., Springfield, Mass., as while working at the Springfield Industrial Institute he had been employed on the first ten Duryea cars that

were ever built for sale. He remained with the Overman Bicycle Co. until 1908, during which time several vehicles were built. The last car build at the Overman works was the foundation of the afterward famous Knox car. This was a four-wheel runabout weighing about 1000 lb. and having a 90-in. wheelbase. E. A. Cutler, Springfield, Mass., became interested in the car and associated himself with Mr. Knox in 1898, forming the Knox Auto Co.

In 1899, in his engineering capacity for the Knox company, Mr. Knox built about twelve or fifteen cars, and 1900 over 100 of the three-wheel Knox runabouts were sold. Chas. Y. Knight, inventor of the Knight engine, earned the right to be mentioned in a New England engineering story by buying one of the first of these cars. Mr. Knox sold out his interest and resigned as vice-president and general manager of the Knox Automobile Co. in 1904, forming the Knox Motor Truck Co. of Springfield, Mass. The previous Knox company forced him to abandon the name Knox in connection with his manuracturing activities and the company was renamed the Atlas Motor Car Co. with Mr. Knox president and general manager.

Knox Used Worm Drive

The Atlas Co. built several two-cycle, two-cylinder runabouts in 1908 and in 1910 and 1911 a considerable number of two-cylinder two-cycle taxicabs. In 1912 Mr. Knox designed and built a large touring car with worm drive equipped with the Atlas-Knight engine, and in this year plans were made to build a quantity of these cars, but owing to inability to obtain engines the scheme fell through.

The business of the Atlas Motor Car Co. was closed in the Spring of 1913, and at that time Mr. Knox joined the ranks of those who had migrated from New England and located with the Lyons Atlas Co., Indianapolis, Ind.

Hiram Percy Maxim, inventor of the Maxim silencer and president of the company which manufactures this device, is one of the early New England automobile engineers. As has been indicated, Mr. Maxim and Mr. Alden were connected in the development of the three-cylinder tricycle in 1894 and 1895 and under Hayden Eames of the Pope Mfg. Co. this was actively manufactured in Hartford. Col. George Pope, chairman of the New York Show Committee for many years, took his first ride in a Columbia automobile with Mr. Maxim in October, 1895, and in 1896 Mr. Maxim was interested in the building of Columbia electric cars, which were sold abroad and in this country for $3,000 each. In 1898 and 1899 a single-cylinder four-cycle engine was developed by Mr. Maxim for the Columbia Co., and this machine proved to be very successful, making good records in many of the endurance runs such as the Automobile Club of America run from New York to Buffalo, 1903. This machine was the well-known Columbia Mark VIII. In 1903 some of the two-cylinder Columbias were developed. Mr. Maxim still remains a New England engineer, although his activities are now in connection with the silencer and not with the motor vehicle.

Tried Electric Tricycle

Another engineer whose early associations were in and around New York and then in New England and who has remained in that part of the country is A. L. Riker, now a member of the Naval Consulting Board under Secretary Daniels, and chief engineer and vice-president Locomobile Company. Mr. Riker's connection with the automobile industry began with his application of a storage battery to an automobile in 1890. This was a tricycle known as the Coventry rotary. He sold his first electric motor car to J. R. Whiting in 1897. Mr. Riker's activities were with the Riker Motor Vehicle Co. in Elizabethport, N. J., until 1902 when he went with the Locomobile Co., Bridgeport, Conn. His call to the Locomobile Co. in 1902 was for the purpose of developing a gasoline car. Mr. Riker was the first president of the S. A. E.

New England activities in the S. A. E. have never been more strongly represented than by Henry Souther, whose work as chairman of the Standards Committee will long be remembered. Mr. Souther earns the right to be called a New England pioneer due to his connections with the Pope Mfg. Co. in 1895 where he was associated under Hayden Eames with Messrs. Maxim and Alden. Mr. Souther was sent abroad in 1895 by the Pope company, and in 1899 left their employ and took up the work of consulting engineer, during which time he did considerable work for the Locomobile, Knox, Duryea and Columbia companies. Mr. Suther also joined the movement away from the New England States and has now taken up his work as vice-president and general manager of the Ferro Machine & Foundry Co., Cleveland Ohio.

If the development of automobile engineering in New England is to be studied, the Stanley automobile made by the Stanley brothers, F. E. and F. O., must be cited as one of the landmarks. The first Stanley automobile ever put on the road was in the Spring of 1897. The Stanley brothers are from Lewiston, Me., and it was in this town in 1887 that they received their first inspiration to build steam cars. Their experiments were continued for ten years, the first car being built, as stated, in 1897. In 1899 John Brisben Walker, a magazine publisher, entered the ranks of the New England automobile engineers by purchasing the Stanley works in 1899, but afterward sold the plant at Newton to a Mr. Barber. After this, the Stanley brothers bought back the Newton plant and in 1902 again resumed the manufacture of cars which has been continued to date.

Zenith Reached in 1909

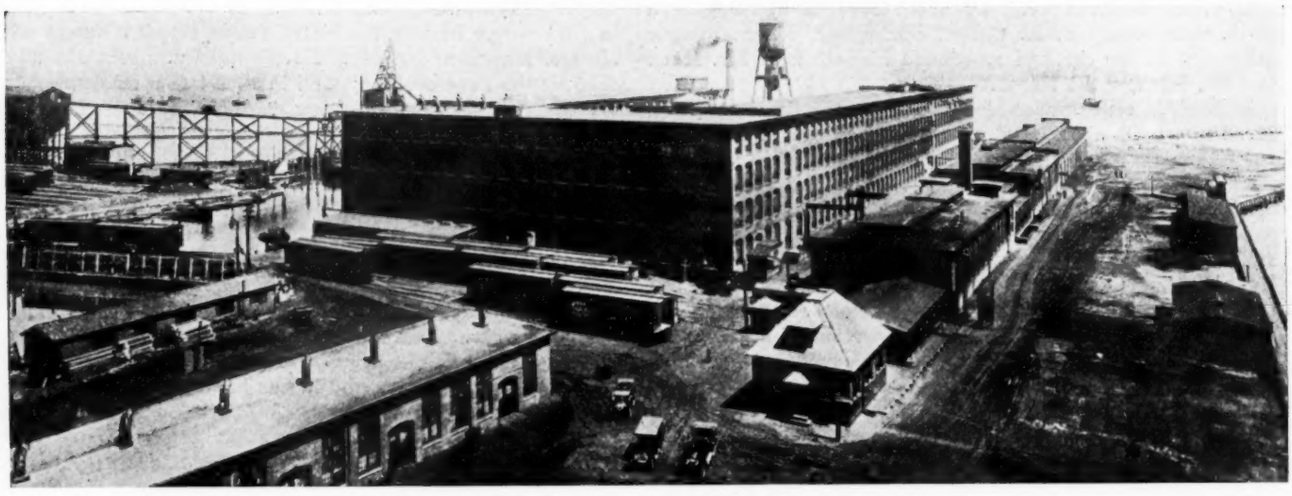
The zenith of automobile manufacturing in New England was reached in 1909 and 1910. Big companies like Alco, Pope-Hartford, Stevens-Duryea and others were then actively making cars which possessed national reputations for excellence. In addition, large numbers of concerns building various accessories began to enter the business, and since then this field has been growing rapidly. As a consequence, from 1910 on the ranks of the New England automobile engineers have been steadily augmented, but in the infancy of the automobile business the men connected with the industry were with the automobile manufacturing concerns as indicated by the representative men mentioned together with many others such as H. Vanderbeek, H. S. Baldwin, who were on the engineering staff of the company which was named successively Pope Mfg. Co., motor carriage department, Columbia & Electric Vehicle Co., and Electric Vehicle Co.

Although in numbers the factories that produce automobiles in New England are not as great as a decade ago, it does not mean that the automobile industry has ceased to depend on that part of the country. In fact, the New England engineer is a very influential factor to-day in the automobile industry. His development of tools, machinery, fabrics and other manufactured products makes him a very necessary link in the chain which connects the finished automobile to the raw material. New England's great population of trained mechanics and engineers have every reason for appreciating the automobile, their environment, training and inborn mechanical ability demand it.

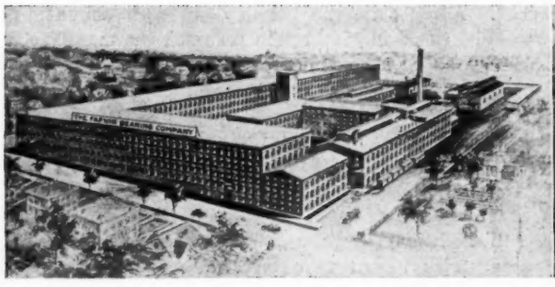
Various causes led to the movement of many of the early New England engineers to other cities, especially the abandonment of the automobile business by some of the concerns such as the American Locomotive Co., when men like B. D. Gray, who was chief engineer for that concern and who is now vice-president and manager of the Hess-Bright Mfg. Co., left for other fields.

The shifting of the industry to the westward has caused the shifting of men, but the effects of the impetus given by the New England engineers will not cease to be felt for a century.

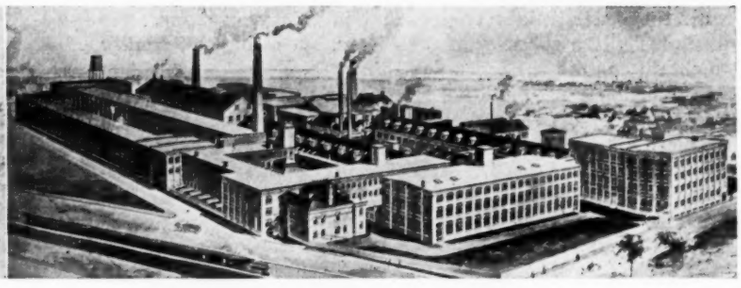
A Few of New England's Factories



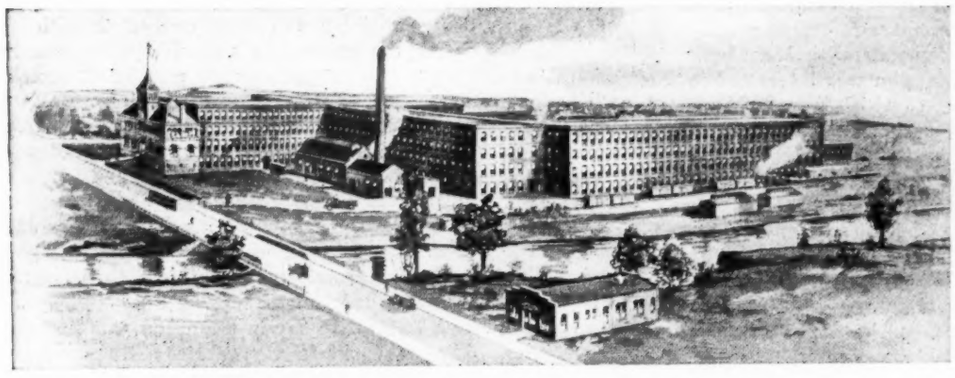
The Locomobile Co. of America, Bridgeport, Conn.



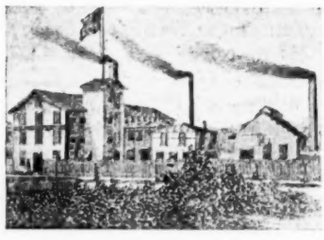
The Fafnir Bearing Co., New Britain, Conn.



The Bridgeport Brass Co., Bridgeport, Conn.

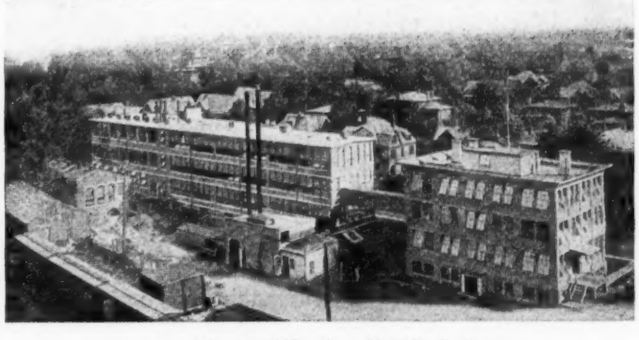


The Billings and Spencer Co., Hartford, Conn., as it is today



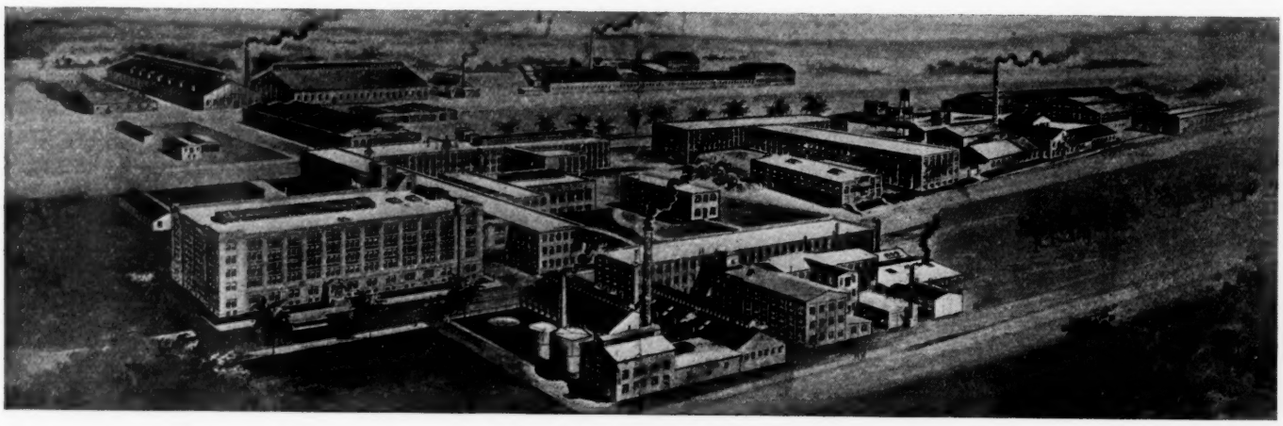
The Billings and Spencer Factory as it was originally

The Bosch Magneto Co., Springfield, Mass.



The Veeder Mfg. Co., Hartford, Conn.

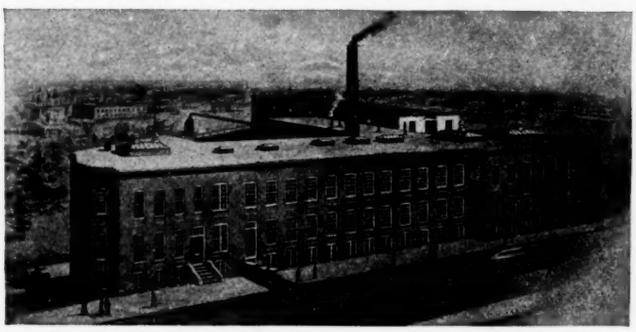
# of Both the Past and the Present



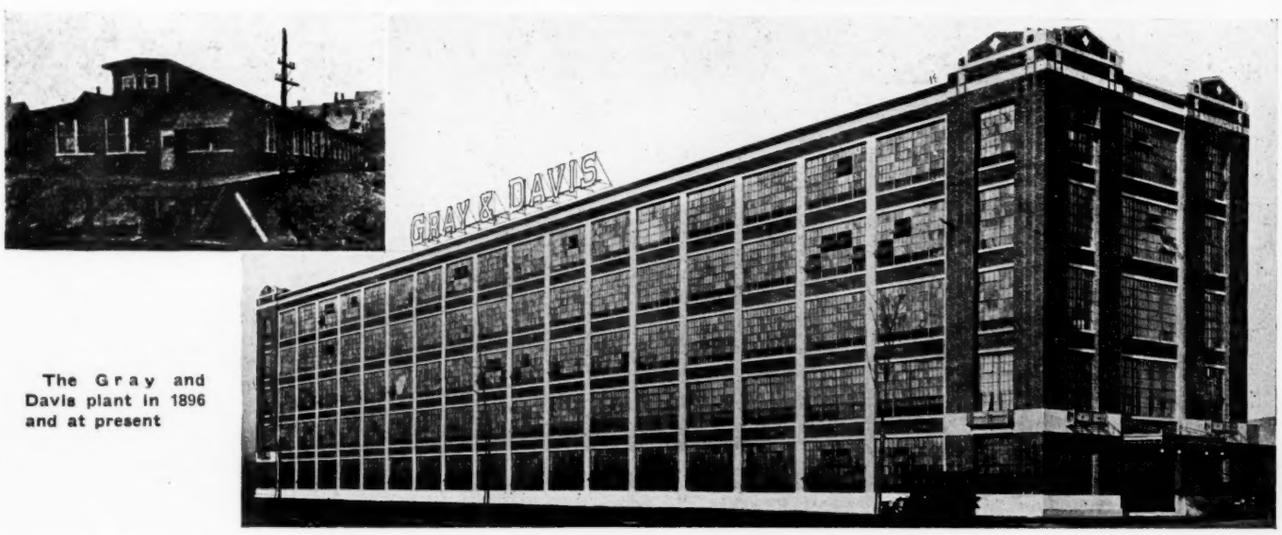
New Departure Mfg. Co., Bristol, Conn.

Left—The Waltham Watch Co., Waltham, Mass., as it is today, and, right—as it was in 1854

The Randall-Faichney Co., Boston, Mass.

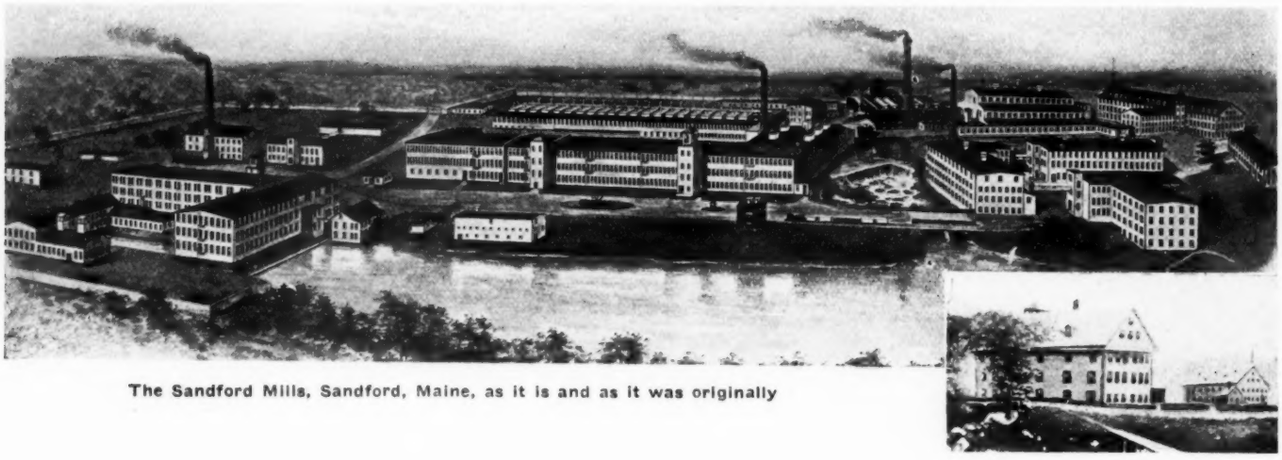


The Chelsea Clock Co., Boston, Mass.

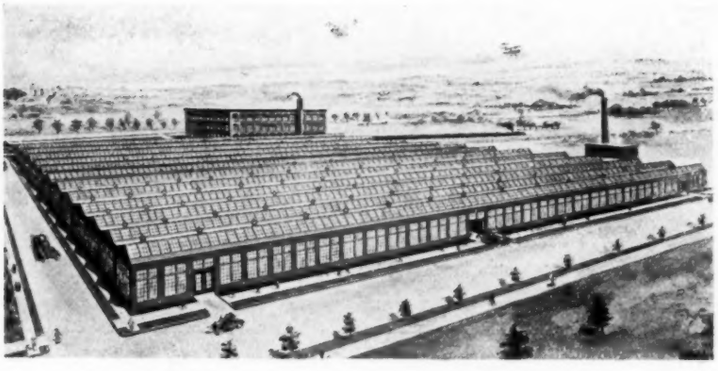


The Gray and Davis plant in 1896 and at present

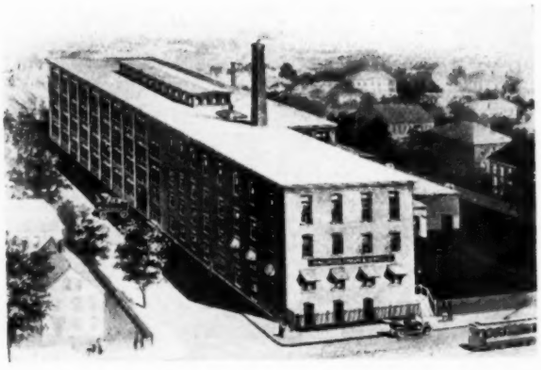
A Few of New England's Factories



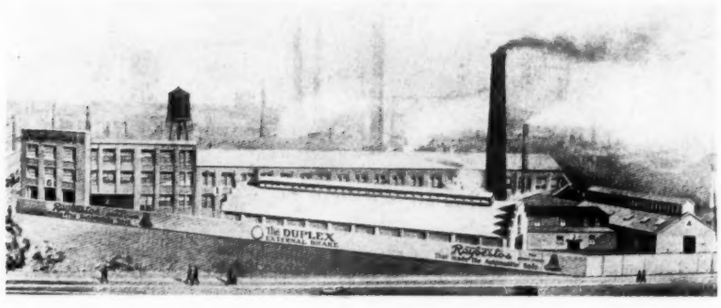
The Sandford Mills, Sandford, Maine, as it is and as it was originally



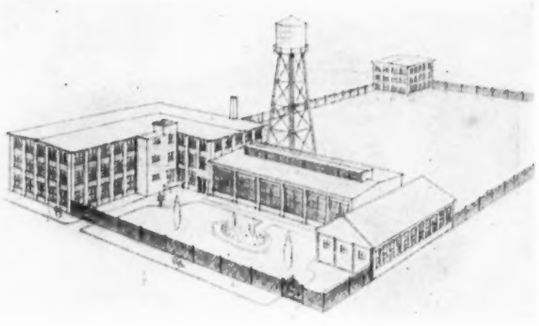
The Metz Co., Governor Gore Plant, Waltham, Mass.



The Baldwin Chain and Mfg. Co., Worcester, Mass.



The Royal Equipment Co., Bridgeport, Conn.



G. W. J. Murphy, Amesbury, Mass.

The Hartford Rubber Works (United States Tire Co.), Hartford, Conn.

# of Both the Past and the Present

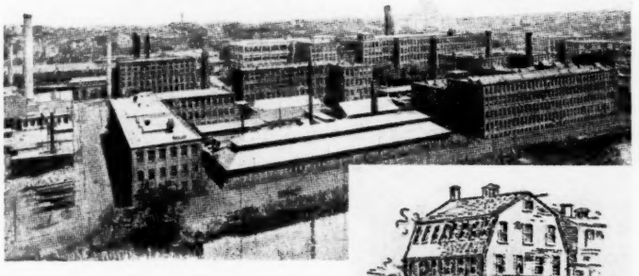
Above—The Dover Stamping and Mfg. Co., Cambridge, Mass., originally and today. Right—The Whitney Mfg. Co., Hartford, Conn.

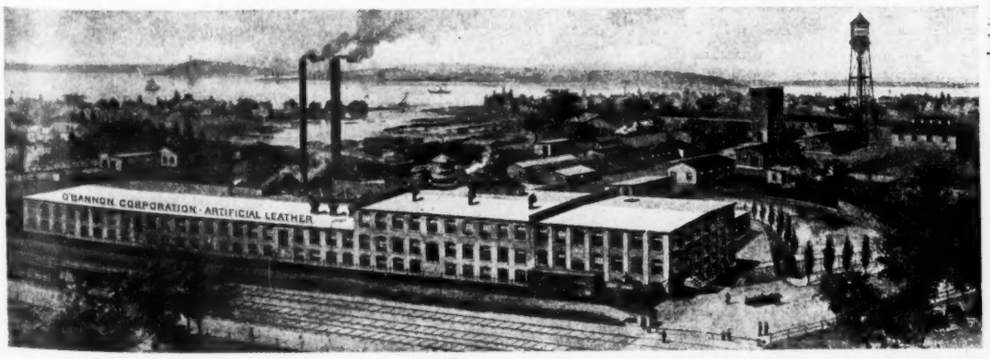
The Hoyt Electrical Instrument Works, Penacook, N. H.

The Auto Parts Co., Providence, R. I.

The Standard Thermometer Co., Boston, Mass.

The Heald Machine Co., Worcester, Mass.





Above—The original and present plant of the Brown and Sharpe Mfg. Co., Providence, R. I. Left — The O'Bannon Corporation

New England News of '99

Many Curious Ideas Shown in Paragraphs From "The Motor Vehicle Review" of 1899 and 1900—Liquid Air Automobiles Expected—Mile Record 1.34 4-5—Plans of First Boston Show

The First Doctor Automobilst

SPRINGFIELD, MASS., Nov. 6, 1899—Dr. A. O. Squier, of this city is the first Western Massachusetts physician to discard the horse and buggy for the motor vehicle, and now his fellow-physicians are watching him with not little curiosity, slightly tinged with envy.

Electric Does 25 Miles on One Charge

BOSTON, Sept. 22, 1899—One of the chief difficulties that the manufacturer of electric motor carriages has had to contend against up to the present time is an inability to produce a carriage that will run for any considerable distance without recharging the storage batteries. The extreme limit of distance thus far scored is 25 miles.

Police Use Automobiles

BOSTON, Sept. 22, 1899—Mayor Quincy's experiment in the use of motor vehicles for the chiefs of city departments is proving successful. Only one carriage has been tried as yet, but it has been stated that it does the work of three horses. It is used for many business trips around town for which a horse with wagon was formerly needed. The motor vehicle does not have to rest, as a horse does. Mayor Quincy has ridden in it several times.

Liquid Air Automobile Co. Formed

BOSTON, Sept. 7, 1899—The Liquid Air, Power & Automobile Co., Boston, has purchased a five-story and basement brick factory in Cambridge, to manufacture liquid air for automobiles and other machines run by that power. The patents owned by that company cover processes which are claimed to reduce the cost of manufacture to a minimum, and to enable the practical application of liquid air energy as power for driving all sorts of machinery. The company's automobiles, run by this power, weigh less than 300 lb., and would make a trip of 100 miles at an expense of only a few cents.

Mile Road Record, 1.34 4/5

BROCKTON, MASS., Oct. 17, 1899—The fastest mile ever ridden over a highway in a vehicle was made yesterday afternoon on the State highway at Whitman, by the motor vehicle built and owned by the Marsh brothers of this city. The time for a warming up mile was made in 1 min., 51 and 1/5 sec., thus establishing a new 1-mile motor vehicle record for the world. Mr. Marsh opened the throttle suddenly and the vehicle, with its 350 lb. of weight, the lightest in existence at that, shot up the hill like a bolt of lightning. Immediately after this performance a mile was made in 1 min. 34 and 4/5 sec.

Covered 150 Miles in 12 Hours

WORCESTER, MASS., Aug. 25, 1900—The first two-seated motor vehicle has made its appearance here. It is the property of J. W. Bigelow, and was brought here from the Locomobile factory. A trip of 150 miles was made in 12 hr.

Records Cause Wonder

PROVIDENCE, R. I., Feb. 14, 1900—Motor vehicles are coming into wider use in this city among society people and business men, and are rapidly supplanting the fractious horse. Three years ago, when these vehicles first appeared on the streets on their way to Narragansett Park, where the first big race was to be held, they were a novelty and attracted wide attention. The records made by the electric and gasoline carriages were subjects of wondering comment, and their cost, stated at upward of $1,000 each, seemed prohibitive.

Boston to Have Automobile Show

BOSTON, Dec. 8, 1900—There is a rumor that Boston will witness a motor vehicle exhibition in Mechanics' Building early next spring. The effort to bring about the holding of such an exhibit is being made by a large number of men who are not interested in the motor vehicle for monetary gain, but rather for personal pleasure and comfort.

University Automobile Clubs in 1900

NEW HAVEN, CONN., Nov. 24, 1900—Motor vehicle clubs composed of students of the various universities are now being formed. A meeting of the Yale students to organize will be held in the near future. Harvard motorists have also been asked to organize.

Status of Automobile

WORCESTER, MASS., Nov. 27, 1900—Steps have been taken in court in this city to determine the legality of motor cycles and motor vehicles as vehicles. Efforts will be taken to secure recognition for motor vehicles on a footing with the regular horse carriage. The question of liability for runaway accidents is what is scaring motorists of Worcester and the State. It is well known that the horseless carriage is almost everywhere causing accidents beyond city limits by reckless and fast driving. It is claimed that the users of motor vehicles are liable for all damages caused on the road, inasmuch as the motor vehicle has not legal license to use highways.

Good Roads Closed to Automobiles

BOSTON, Feb. 15, 1900—The motor vehicle has created a storm in this city. These vehicles are prohibited on most of the good roads in and around this city. If you engage an electric cab for a run out to Brookline you will notice that the driver stops on entering Brookline. He gets from his seat and goes to the back of the cab. There he attaches a black tag with the license number of the cab, printed in white thereon. The figures are large. They are fully 2 in. high.

Must Stay Outside Cemetery

BOSTON, Feb. 15, 1900—A notice has recently been posted at the main entrance to Forest Hills Cemetery, this city, reading "Automobiles are not allowed in this cemetery." As stated by the secretary of the cemetery company, "We cannot afford to run the risk of having automobiles cause trouble in the cemetery. We have agreed with many of the lot owners that we shall take perpetual care of their lots, and make good any damage to them. Some of the protected property includes valuable monuments and other marble work of value, and the risk of having some horse frightened by an automobile is more than we care to take. If an automobile should swoop suddenly down on a funeral procession there might be a regular stampede."

First Accident Suit in Boston

BOSTON, June 6, 1900—The first suit growing out of an accident caused by a motor vehicle came up for trial in the U. S. circuit court to-day. The plaintiff seeks damages of $25,000, alleges that the accident was due to the negligent, careless and unskillful manner in which the vehicle was managed and controlled. The defense is that the plaintiff walked against the machine.

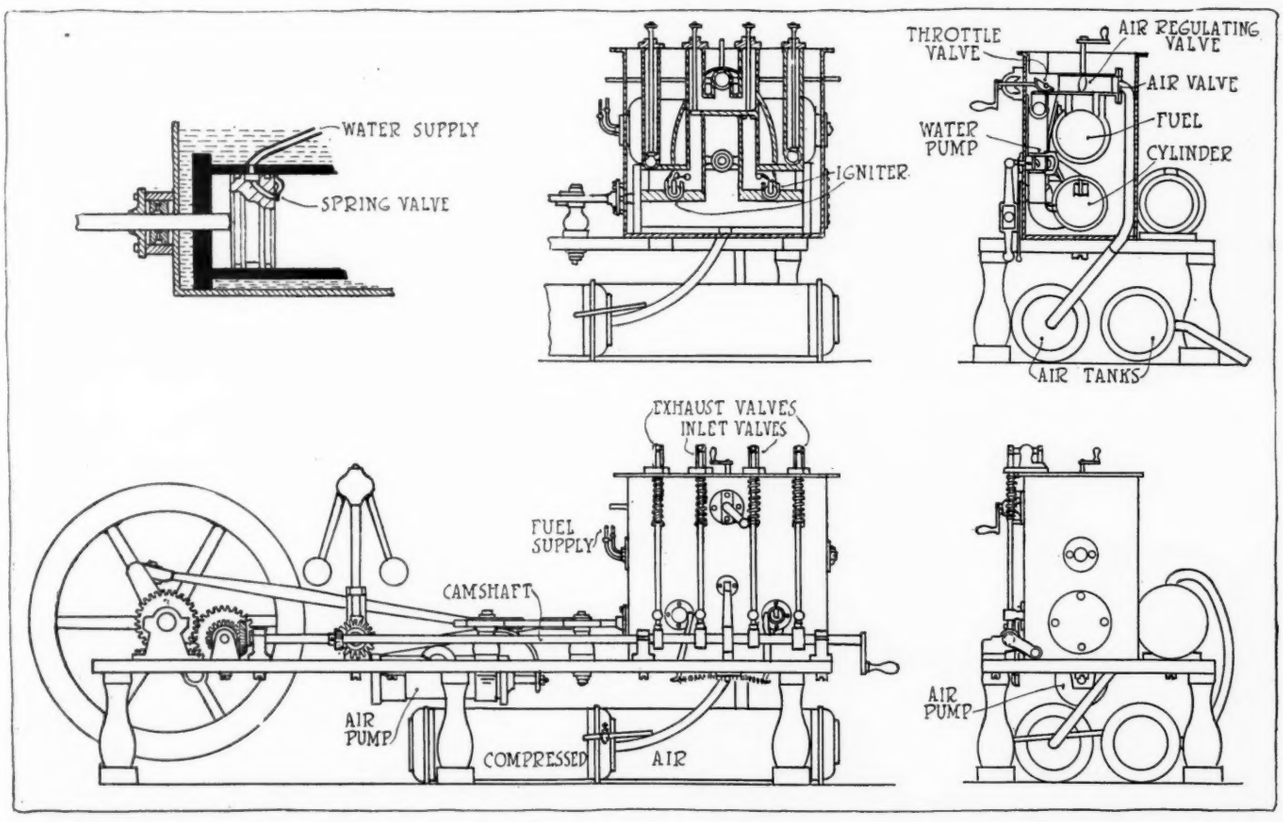
The History of the American Automobile Industry—19

Stuart Perry an Important Man in Early Development—Water Used as Lubricant—Tried Compressed Air Starting System—Grasped All Essentials of the Gasoline Engine

By David Beecroft

IN developing the internal combustion engine too great credit cannot be given to the work of Stuart Perry of New York, whose patents, issued in 1844 and 1846, showed a practical engine. Perry's accomplishments were outlined in last week's issue and we are fortunate in being able to illustrate his motor this week, the illustrations being taken from his patent papers. Unfortunately we cannot show a complete cross-section of the engine, but in the upper left is a section showing one end of the cylinder with a double-acting piston; that is, an explosion taking place at either side of the piston the same as pressure is applied to each side of a piston in a steam engine.

Perry's engine was a vertical type with valves located in the cylinder head, with waterjacket for the cylinder walls, cylinder head and valve parts, but not resembling the present-day engine very much, but rather being fashioned after steam practice of 70 years ago. As stated last week, Perry used an air starter and, in fact, his patent drawings show no effort of attaching a starting crank,



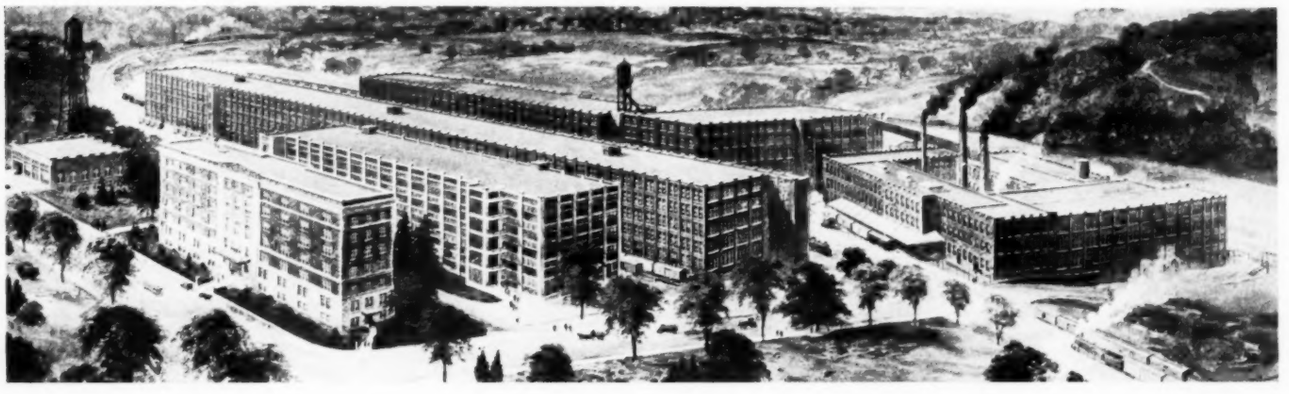
Details of the internal combustion motor of Stuart Perry, New York City. This was invented in 1844 *and* 1846. *The upper left illustration shows how he lubricated the piston and cylinder by water. The other illustrations show his system of air-starting, and the small handle on the external camshaft was set by hand to start. The upper right illustration shows how Perry used a throttle valve to regulate the flow of mixture with the cylinder. He also used a regulating valve to control the flow of air with the object of securing a satisfactory mixture. Perry's motor was a double-acting type; that is, an explosion took place at either side of the piston. It was entirely water-jacketed, used tube ignition and had intake and exhaust valves operated from an external camshaft.*

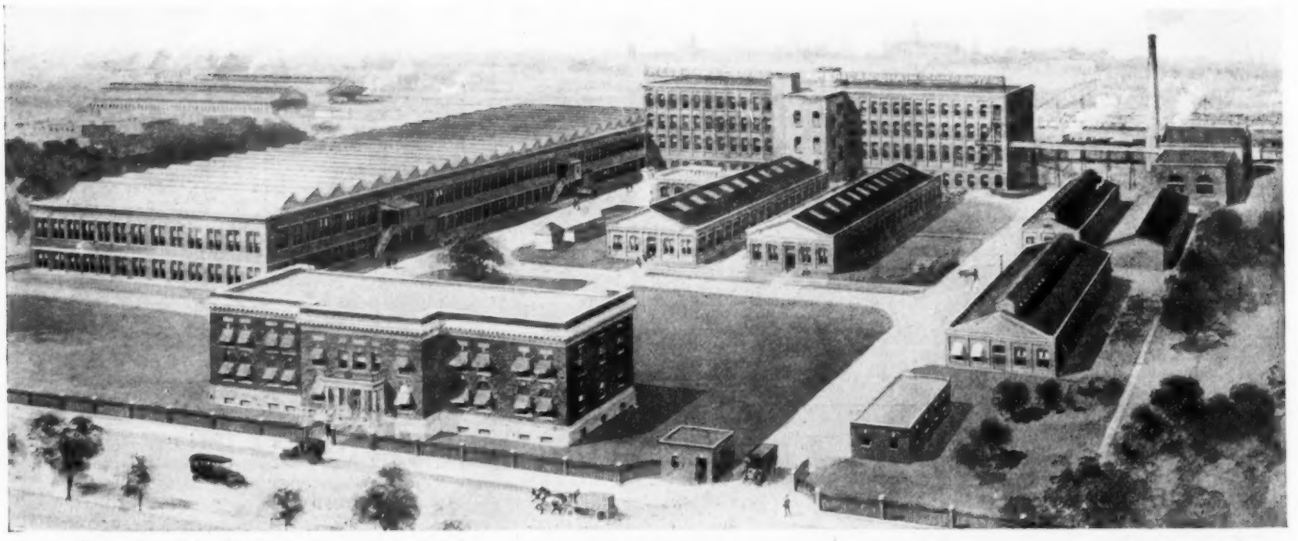
rather there is a miniature crank attached to the external camshaft, which crank was used to put the camshaft in the proper position for starting; that is, to open the intake valve to admit the explosive mixture when it was ready and then to close the valve and revolve the cover on the platinum ignition tube so as to let the heat of the tube explode the mixture.

As several of the illustrations will show, Perry used two large air tanks, one of which was connected with an air pump, either driven by hand or from the motor. The usual valves were employed in the air system for conducting the air into the cylinder for starting purposes.

Perry relied entirely on water to lubricate the cylinder and piston. The upper left illustration showing a section of the piston discloses how there was a water supply pipe leading through the cylinder wall and registering with a water groove in the piston. This water pipe registered with the groove when the piston was at the end of the stroke. There was a double-acting water pump shown in the upper right illustration which was connected with the water supply pipe leading to the piston so that when the piston registered with the pipe as illustrated, a stroke of the pump plunger delivered water into the piston groove. This groove connected with a spring valve in the piston so that the water pressure opening this valve permitted a part of the water supply to be injected into the cylinder. This supply was considered sufficient not only to aid in lubrication, but also to add its expansive force. In addition the piston rod was lubricated by a water packing gland. At either side of the water groove in the piston were packing arrangements to retain the water in the groove.

To start his motor Perry realized the necessity of heat to vaporize the spirits of turpentine used as a fuel and it was doubtless this difficulty of starting that led him to use the compressed air, which assisted the explosive power of the mixture in starting. He did not use a carbureter, as we understand it to-day, but employed a retort into which the spirits of turpentine was fed. This retort was waterjacketed and it was necessary to heat the water by external means to a point where the turpentine was converted into a gas. When the necessary mixture was obtained the camshaft was turned by hand to the proper position to open the intake valve and at the same time closing the exhaust. The mixture then filled the cylinder and a further turn of the camshaft closed the intake valve and uncovered the ignition tube. After the first explosion it was expected that the regular cycles would continue the explosions, the camshaft being driven from the crankshaft after its first setting by hand.





Two New England factories. The Fisk Rubber Co., Chicopee Falls, Mass., and below, the American Chain Co., Bridgeport, Conn.

Floating Bush Bearings in Live Rear Axles for Trucks

A British Opinion on Commercial Vehicle Design

IN a paper presented to the Institution of Automobile Engineers and discussed at a recent meeting of this society, George W. Watson, a member of the council, reviews all construction features in live axles for commercial vehicles with critical comment and illustrations. The usual distinctions between floating, semi-floating and non-floating axles, as well as between "solid forging" and built-up axles, are made the basis for the division of the subject and the cast-steel wheel is the type contemplated as used. Among the statements made by the author, and in the discussion by members of the British society, those of greatest interest to the American industry are quoted in substance in the following. The remarks referring to floating bushes for wheel bearings in heavy vehicles are perhaps specially interesting, as this system was proposed for bicycles many years ago in this country—somewhere about the year 1899—on the plea of reducing friction and equalizing wear of the stationary member of a bearing almost or fully as much as ball bearings, but has not been employed extensively here for motor vehicles.

For vehicles intended for use on paved or good macadam roads the author advocates worm drive for all axles up to six-ton limit of axle weight, but for heavier and slower vehicles he considers the double-reduction type to be the better, particularly if the differential is mounted on the crown wheel shaft and the final drive taken through two pairs of spur gears, as in the construction shown in the accompanying illustration. This construction is on the whole one which he considers very favorably, also in other details.

In some cases, where ample ground clearance is wanted, the worm drive may not be acceptable, he holds, "because it is not practicable to make a worm wheel as small in diameter, for a given gear ratio and load, as may be given to the final gear wheel of a double reduction axle."

It is mentioned as an objection to the spur gear type of differential that there is double the amount of backlash, as compared with the bevel gear type, due to the aggregate clearances between bearings and gear teeth, and this he considers in time liable to become serious.

To make axle shafts and driving flanges in one piece is held to be bad practice, because the flanges are apt to be bent by rough handling in repair shops, and if the flange is subsequently bolted up tightly to the wheel, the shaft is liable to be badly stressed, causing serious fractures.

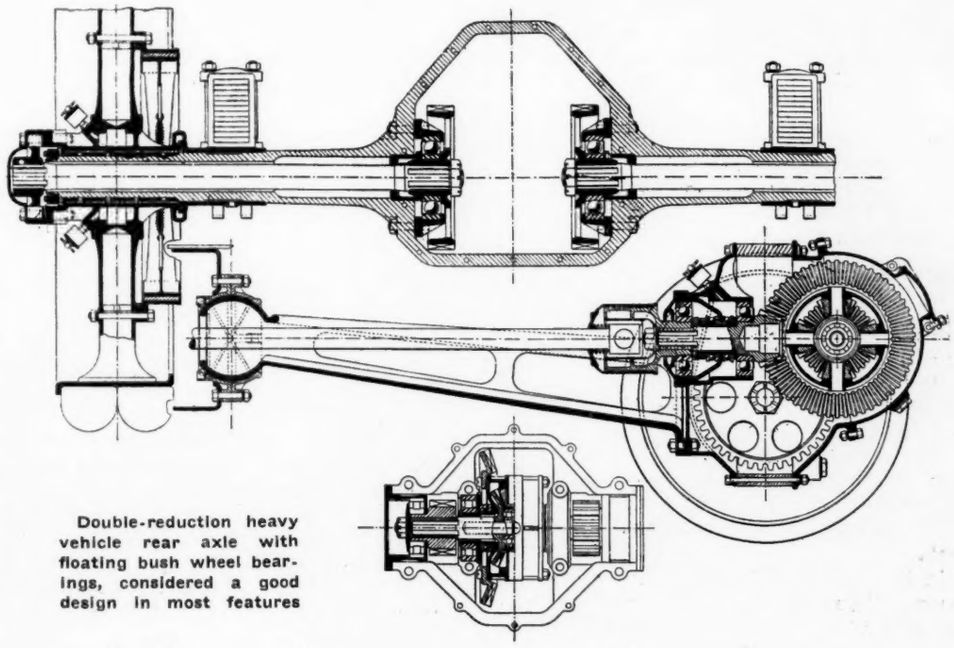
It has been proved that in the hubs of road wheels floating bushes are much better suited to the rough usage of commercial service than any tried form of roller or ball bearing. A wheel with floating bushes is easily and quickly replaced in the event of tire damage, and such a bush properly made and fitted offers very little more friction than a ball bearing hub of equal load capacity, except when starting from rest.

Both the external and the internal clearance should be greater for floating bushes than would be allowed for any ordinary bearing. The army specifications allow between 0.006 and 0.0136 of an inch for both outside and inside fits, and the normal diameters of the bush to which these limits refer are 3.5 and 4 in. With closer fits the lubrication becomes uncertain. The play noticed with the larger clearance, when the axle is jacked up, is more apparent than real, and it makes the removal of the wheel easier.

The distribution holes in floating bushes should be drilled along a helical line and spaced so as to carry grease (or heavy oil) to every bit of the axle and hub surfaces. The rubbing surfaces of both axle and hub should be ground and polished to secure the best results, and, if the hub is a casting, it is therefore advisable to force into it a steel liner by hydraulic pressure, with subsequent grinding of the bore. Care should be taken to remove thoroughly the metal particles that may be left in the oil passages after the grinding.

According to the author's experience it is not necessary to harden the wheel journals of an axle, provided the pressure caused by load and tractive resistance does not exceed 400 lb. per square inch between the axle and the floating bush.

In no part of an axle should end-thrust be left to take care



Double-reduction heavy vehicle rear axle with floating bush wheel bearings, considered a good design in most features

of itself. Where it is not possible to fit a single or double thrust ball bearing, a floating washer of phosphor bronze not less than 5/16 in. thick should be provided, and it should be placed between steel surfaces that are ground, though not necessarily hardened. Casehardened thrust washers, particularly when used with floating bushes in wheel hubs, have an unfortunate habit of cracking.

Objects to Truss Bars

The truss rod or tie bar for any axle subject to great variations of the load is a source of weakness, because it cannot be adjusted to balance the stresses which are set up. The careless adjustment of a tie bar, to take all sag out of an axle when it is under full load, may lead to excessive bending stresses in the axle casing in the opposite direction when the load is removed. Generally, in practice, as has been shown with the army trucks in France, it is the tie rod which gives out first, but injury to the axle frequently follows. [No mention is made by the author of the use of suitable rebound checks to prevent the oscillation of the axle and transmit excess loads to the vehicle frame, although this expedient, if properly designed, may save as much material and weight in the axle as the use of a truss bar and is not subject to the objection mentioned against the latter.]

In the matter of lubrication of the axle, the author prefers to allow the free passage of oil from the central casing to the wheel journals, rather than to take constructive measures to prevent such leakage, provided only that steps are taken to drain the leakage away from wheels and brakes. One of the reasons for the preference is that drivers are more likely to give attention to the lubrication of the axle if they are not put to more trouble than that of dropping an occasional pint of oil into the central casing. He has also found it to be good practice to mill a broad flat on the top side of the wheel journals, when plain or floating bushings are fitted, as this flat facilitates the distribution of lubricant over the whole length of the bearing. All thrust washers should be provided with distribution paths, preferably in the form of eccentric grooves, with the throw of the eccentrics on the two sides arranged diametrically opposite; otherwise the washer may be so weakened that it will split along the groove. Cross or radial grooves invariably lead to breakage of the washer.

In the discussion of Mr. Watson's paper it was brought out that several members consider the matter of unsprung axle and wheel weight rather unimportant for trucks; that the forged axle is widely preferred to the cast one but is difficult to obtain in Great Britain—not only under war conditions; that internal-gear drives are considerably lighter than axles with double gear reduction, and that the preference for floating bushes over ball bearings in wheel hubs and for differentials, is not unanimous, as ball bearings have been proved reliable for the heaviest vehicles and their interchangeability is a highly appreciated feature.

Automobiles Save 32 Cents Per Mile in Road Supervision

IN these days of efficient and businesslike methods the government authorities do not intend to be outdone in these respects. An evidence of this is the report of cost data kept on three low-priced automobiles used in supervising work on the Washington-Atlanta Highway by the Office of Public Roads and Rural Engineering. E. W. James, chief of road maintenance in this department, states that, based on records kept since May 24, 1914, when the cars were put into service, through December, 1915, the cost of transportation per mile of road under supervision averages 20 cents per month. The only comparable cost figures for the use of livery horse vehicles for similar work give 52 cents per mile per month for transportation. The economy of the automobile in this work is emphasized by the large possible saving of time, and thereby money, developed by the field men of the office.

42.9 Miles per Day

Of the three cars in use, that having the lowest mileage to date has run an average of 28.4 miles per day, thirty days a month, since going into service. The highest mileage shows 42.9 miles per day for the same period.

As shown in the accompanying tabulation, the average cost per mile of all three cars since put into service was 4.13 cents, including a general overhauling on each.

In the first tabulation is given a summary of the miles run, total cost and cost per mile of each of the three cars during each month of 1915, together with the totals for the year, for the year 1914 and the grand totals including all costs since the cars were put into commission.

The second table gives the average cost of gasoline, oil, tires, storage, etc., on each car for the years 1914 and 1915, with the weighted averages for total operation costs during the entire term of service of the vehicles. In the last column of this tabulation is given the common average for all cars for the whole period.

Summary by Months of 1915 of Cost Data on Three Cars Used in Road Supervision

	Car No. 1			Car No. 2			Car No. 3		
Month	Miles Run	Total Cost	Cost Per Mile	Miles Run	Total Cost	Cost Per Mile	Miles Run	Total Cost	Cost Per Mile
January	563	$43.19	$0.0767	807	$39.75	$0.0493	203	$61.35	$0.1546
February	....	9.60	....	780	45.85	0.0587	583	13.61	0.0234
March	635	62.25	0.0979	1,557	64.42	0.0413	1,169	32.63	0.0278
April	848	20.49	0.0241	1,404	64.37	0.0457	1,391	37.01	0.0265
May	1,023	51.50	0.0504	1,947	64.81	0.0333	1,322	59.33	0.0448
June	865	32.78	0.0376	1,198	61.10	0.0508	1,456	74.99	0.0514
July	838	47.89	0.0570	1,461	37.24	0.0255	1,412	50.89	0.0360
August	1,031	48.19	0.0468	690	15.19	0.0220	1,495	61.75	0.0414
September	1,018	28.02	0.0275	1,249	53.20	0.0426	965	42.65	0.0442
October	1,070	46.78	0.0436	1,366	65.28	0.0478	1,195	34.96	0.0292
November	978	31.40	0.0321	1,485	47.49	0.0319	1,172	46.99	0.0401
December	1,149	53.39	0.0465	1,240	43.49	0.0350	1,156	63.68	0.0550
Totals	10,018	$475.48	$0.0475	15,184	$602.19	$0.0397	13,519	$549.84	$0.0407
1914 totals	6,210			9,308			8,712		
Grand totals	16,228			24,492			22,231		

Averages on Operation Costs of the Three Cars

	Car No. 1			Car No. 2			Car No. 3			
Item	1914	1915	W'ght'd Avgs.	1914	1915	W'ght'd Avgs.	1914	1915	W'ght'd Avgs.	Com. Avg.
Aver. cost of gas per gal. (cts.)	20.01	18.96	19.35	18.96	18.32	18.56	16.77	16.18	16.41	18.10
Miles run per gal. of gas	17.52	16.29	16.74	17.45	15.66	16.29	19.73	19.76	19.75	17.59
Miles run per lb. of grease	282.27	500.90	386.38	340.58	446.59	399.35	458.53	500.70	483.28	423.00
Miles run per qt. of oil	62.73	47.03	52.01	81.65	45.06	54.31	86.26	97.87	92.97	66.43
Cost per mile of:	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
Gasoline	1.14	1.16	1.16	1.09	1.17	1.14	0.85	0.82	0.83	1.04
Grease	0.05	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.03	0.04
Oil	0.24	0.33	0.30	0.17	0.30	0.25	0.17	0.14	0.15	0.23
Tire casings	1.15	0.55	0.79	0.90	0.49	0.65	0.48	0.55	0.52	0.65
Other tire cost	0.17	0.26	0.22	0.07	0.22	0.16	0.20	0.15	0.17	0.19
Storage charges	0.89	0.60	0.71	0.28	0.22	0.25	0.64	0.59	0.61	0.52
Miscellaneous	0.76	*1.81	1.41	†1.23	1.53	1.42	†1.28	1.79	1.59	1.47
Total	4.40	4.75	4.63	3.79	3.97	3.91	3.65	4.07	3.90	4.13

*Includes general overhauling in March.
†Includes general overhauling at end of November.

What Good Lighting Really Is*

Automobile Lighting Analyzed from the Lighting Viewpoint

By Emerson L. Clark

THE subject of good lighting is about contemporary with that of automobile engineering, both forming the two youngest branches of engineering work. Artificial lighting has been employed by man for many centuries; likewise man has for an equal period used wheeled vehicles to satisfy his transportation requirements. During the last 15 years transportation by wheeled vehicles has undergone a most extraordinary advance in the development of the automobile. During the same period advances have been made in illuminating engineering which are of comparable importance in the annals of lighting. Thus we see that two such diverse subjects as automobile engineering and illuminating engineering have a few points in common.

Notwithstanding the fact that much information of value in obtaining good lighting has been accumulated and classified, very little of this has been used to improve the lighting of the automobile. I have carefully examined the Transactions of the Illuminating Engineering Society for several years back and failed to find a single paper reporting a study of the lighting requirements of the automobile.

Good Light Essential

Automobile lighting is not merely a luxury—it is a necessity and upon its quality, its suitability, the safety of life and limb depend. Proper appreciation of the importance of the right kind of automobile lighting for preventing certain classes of common accidents is not now exhibited by many persons who should possess it. Good lighting in factories and industrial plants is recognized as being a powerful factor in the prevention of accidents. Statistical plots of the occurrence of accidents throughout the year show that the number of accidents varies directly with hours of darkness. As the days become shorter the number of accidents increase. Proper lighting of the automobile is even more important than the lighting of a factory because the automobile moves rapidly in the midst of other rapidly moving vehicles over all sorts of roads in various states of repair, past innumerable crossings which are always a potential source of accidents.

In to-day's *Plain Dealer* (Jan. 27) I read an account of a man who left his lodge meeting the night before and stepped in front of a swiftly moving automobile on West Twenty-fifth Street and was struck by the machine. The man died on the way to the hospital and the automobile made off before anyone got its number; thus the possibility of ascertaining the exact circumstances of the accident are destroyed. However, it is almost certain that no strong dancing beam of light was illuminating the surface of the road in front of the car for the man would never have stepped into such an attention compelling and obvious field of danger. I recall a particularly deadly accident that occurred in Cleveland shortly after the first dimming ordinance was put into effect. An automobile came on to Lake Avenue from one of the private drives and was struck by a swiftly moving machine running down the avenue. Four people, as I remember, were killed in the first machine. This accident never would have happened had either one of the machines been projecting a strong beam of light so as to strongly illuminate a strip of the road surface a sufficient distance ahead of the car. I would weary you if I recited the list of preventable night accidents, the accounts of which I have seen published in the Cleveland newspapers. It is a large one and covers only a very small section of the country; yet this list by no means includes all or even a major portion of the accidents that happen in this section of the country. I know from experience that but a small percentage of accidents which occur go on record.

The ever present sections of torn up streets, and numerous spots on the road in need of repairs, and countless other contingencies that arise in the course of automobile driving require adequate lighting to assist in avoiding accidents which may injure people or at least damage the machine. Every one recognizes the advantages and increased pleasure in night driving which accompany an adequate road illumination in front of the car, and until the country-wide agitation against glaring headlights imposed its check the tendency was toward increasingly powerful headlights. As a result of the above-mentioned agitation the trend in automobile lighting has been toward insufficient and inadequate lighting with its attendant accidents and dissatisfaction.

The time is now ripe for a complete study of the whole lighting problem to ascertain what the various requirements are, how they can be met and how the conflicting demands can best be reconciled. In the following pages I briefly present such a study.

In order that this work may be better understood it may be well to give a brief résumé of the basic principles of good lighting.

In studying the principles of good lighting it is necessary to consider phenomena relating to three things—first, the light source; second, the objects to be illuminated; third, the eye.

First, considering the light source. The three most important qualities of a light source are intensity, color of light and distribution. Distribution involves both intensity and direction. Light sources are both primary and secondary. The former emit light, the latter reflect it. The sun and the moon are examples of such sources. An incandescent lamp filament and its reflector is another pair of examples.

Intensity of Source

The intensity of a light source is a measure of its strength, of its ability to produce illumination at a distance. Intensity is either a statement of the strength of the light in a certain specified direction or the average of the intensity in a number of different directions. When this is the average of a large number of uniformly spaced directions covering the whole angular space about the source the result is a measure of the total quantity of light emitted. The unit of intensity is the candlepower. The unit of quantity or, more properly, flux, is the mean spherical candle. Another more recent unit is the lumen, one mean spherical candle = 4π lumens, about 12.5 lumens.

Intensity of Illumination

It is necessary to distinguish between the intensity of a source and the intensity of the illumination produced by a source. The intensity of a source does not vary as we move

*Paper read at meeting of Cleveland Section S. A. E., Feb. 18, 1916.

it to different distances, but the illumination produced by a given source diminishes as we measure it farther and farther from the source (if the source is small compared to the distance involved). The intensity of illumination from most sources diminishes as the square of the distance from the source. If the source of illumination is an infinite plane the illumination does not diminish at all at increasing distances from the plane. The nearest practical approach to this in our experience is sky light. The illumination from the sky is the same at the surface of the earth as it is several hundred feet above it. (I shall make use of this point later when I speak of the brightly illuminated surface of the road as a secondary source of light.)

The unit of illumination is the foot-candle; it is the illumination falling on a surface placed perpendicular to the ray at a distance of 1 ft. from a source of one candle. The same surface moved to a distance of 2 ft. would receive an illumination of one-fourth foot-candle.

Another unit of illumination is the lux or meter candle, about 10.7 lux = one foot-candle. Using light flux instead of candlepower the illumination on a surface is equal to lumens falling on the surface divided by area in square feet; this gives the result in foot-candles. If the area is expressed in square meters the result is obtained in lux.

Brightness

The brightness of a surface is not determined solely by the intensity of illumination falling on it, but is also dependent upon the reflecting power of the surface. There are two kinds of reflection, specular, as in the case of a highly polished mirror, and diffuse, as is exemplified in a piece of white blotting paper. The brightness of a diffuse reflecting surface is proportional to the product of the intensity of illumination falling on it and the reflecting coefficient of the surface. The reflecting coefficient of our best white surfaces seldom exceeds 80 per cent, while that of our common black surfaces is seldom less than 5 per cent; most surfaces fall between these limits.

Brightness is measured in candles per square inch. It is also measured in Lamberts, when one square centimeter reflects diffusely one lumen of light its brightness is one Lambert. Candles per square inch multiplied by 0.4868 equals Lamberts.

Color

The next important quality in a light source is color. In some branches of illuminating engineering this has to be considered carefully. In automobile lighting there are so many other important points to consider that the matter of color can be dismissed for the present.

Distribution

If one wished to define illuminating engineering in very few words he would not be far wrong if he called it the scientific distribution of light. The distribution of light intensity in different directions from a light source is a matter of extreme importance. The light from an ordinary headlight bulb is fairly uniform in intensity in different directions where not obstructed by the base. When this bulb is placed in a parabolic reflector the distribution of intensity from the complete unit is profoundly modified. The distribution characteristics of a lamp determine how these lamps should be placed to produce a given lighting result.

Another term used in lighting which really comes under the heading of distribution is diffusion. Diffusion is used with a number of special meanings. "Diffused illumination" is often used to describe an illumination which comes from many different directions as from many small separated sources or from one large, very extended source. Sky light out of doors is perhaps the best example of diffused illumination, and sun light an example of directed or non-diffused illumination. A test of diffusion is the sharpness of shadows cast. Widely scattered light from a comparatively small source is often spoken of as diffused light. This is somewhat confusing. The shadow test will distinguish the two cases.

The second important thing to consider in good lighting, namely, the surfaces illuminated, may for the present be passed with the statement that they are made visible by the light reflected from them or from other surfaces around their borders. They reflect both specularly and diffusely, more often diffusely, and their reflecting coefficients will lie within the range of 5 to 80 per cent.

Characteristics of the Eye

Finally we come to the third and perhaps the most important thing to consider, the eye. The eye is the final judge of illumination. Lighting must be adapted to the peculiarities of the eye. Everyone has eyes, but most people are in the dark regarding some of their important characteristics.

One of the most striking characteristics of the eye is the large range of illumination over which it will operate. The brightest sunlight gives an illumination intensity of about 12,000 ft. candles and bright moonlight about .03 ft. candles, a range of intensity of 400,000 to 1. If one passes suddenly from bright sunlight to surroundings illuminated to the intensity of bright moonlight the latter would appear perfectly dark and it would take considerable time before vision would be good. A very much smaller change than this has a very pronounced effect of the same sort. When the eye attempts to see in a reduced illumination its sensitiveness to light increases. This change in sensitiveness is not wholly due to a change in the opening of the iris of the eye as is sometimes popularly stated. The difference in the opening of the iris can nowhere nearly account for the magnitude of the change in sensitivity which is observed. Other very important changes which require considerable time take place within the eye. This increase in sensitivity when surrounded by very low illumination is often called dark adaptation.

When the eye is suddenly changed to greatly increased illumination it is pained, but in a short time adjusts itself comfortably to its new surroundings. The eye adapts itself to brighter surroundings more rapidly than to darker ones. That is, its increase in sensitivity with a given change in surroundings is slower than its decrease with the same amount of change in the opposite direction.

When two surfaces within the field of view are illuminated to very different intensities the eye cannot see them both clearly at the same time nor can it view the brighter and then immediately see well on the darker. For accurate vision on the darker surface the eye requires time for adaptation. If there is any considerable area of the brighter surface in the field of view the eye cannot adapt itself to see well in an area considerably darker. This peculiarity of the eye calls for uniformity of illumination of the field of view.

Contrast

A bright area adjacent to a dark area where the ratio of brightness of the bright to the dark area is very large, causes discomfort and glare, a condition with which we are all familiar. Precise quantitative figures on just what conditions of contrast cause glare and how much glare is caused under any given conditions are not available, but the general factors which go to make up glare are known.

Contrast, or the difference in brightness of an object and its immediate surroundings is a very important factor, but it alone does not determine glare. We have in addition to consider both the absolute brightness of the bright object and also the areas or visual angle involved. For instance, the contrast between some of the fixed stars, which have a far greater intrinsic brilliancy than the sun, and the dark space around the star represents about as large a contrast

as we can obtain, but this combination does not cause glare. The reason is found in the very small visual angle subtended by the star. For the same reason the bare filaments in headight bulbs of the sizes in common use to-day do not cause glare to an oncoming driver, although they are very much more brilliant than the surface of the reflector viewed from the direction of maximum intensity of beam. But we all know that when the eye is in the projected beam a moderate distance from the car glare is produced when the surroundings are dark. In this case the brightness of the reflecting surface is very much less than the filament, but the visual angle subtended is so very much greater, 1800 to 1, that the actual amount of light entering the eye from the reflector is much larger than that coming directly from the filament. Again, a very dimly lighted surface contiguous to an area absolutely black would give a large contrast ratio, but this combination would not cause glare. This would indicate that absolute brightness is also a factor.

We see from the above that we can do three things to lessen glare:

First—Reduce the contrast between the bright object and its darker surroundings either by dimming the bright object or by brightening the dark surroundings.

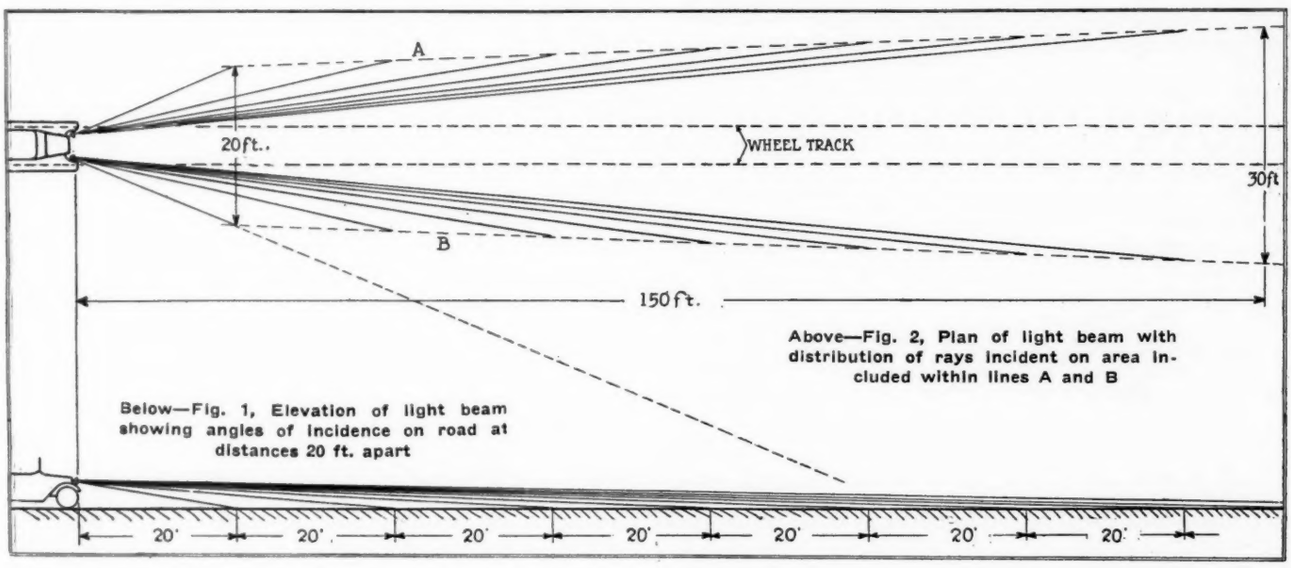
Second—Reduce the angle which the bright object subtends at the eye either by making the object smaller or by getting farther away from it.

Third—By reducing the brightness of the bright object still holding the contrast the same by correspondingly dimming the surroundings.

There is another peculiar characteristic of the eye that has an important bearing on automobile lighting. This is the change in the acuity of vision with the size of the field illuminated. This effect was first announced by Dr. P. W. Cobb of the National Electric Lamp Association and was further studied by Dr. P. G. Nutting of the Eastman Kodak Co. These men have shown by experiment that an illuminated object can be seen much more distinctly when surrounded by a large illuminated area of the same order of brightness, than when surrounded by a dark or dimly-lighted area. Or, putting it in another way, the illuminated object can be seen equally well in a much weaker illumination if the weaker illumination covers a wide area surrounding the object than when the illumination is confined to the immediate neighborhood of the object. This effect is of large magnitude and its importance should not be overlooked in studying the automobile lighting problem. It indicates that for the best results in seeing objects on the road, a large area of the road surface should be uniformly illuminated. The illumination should not be confined merely to a width of the road actually traversed by the car but should extended a considerable distance to both sides of this strip.

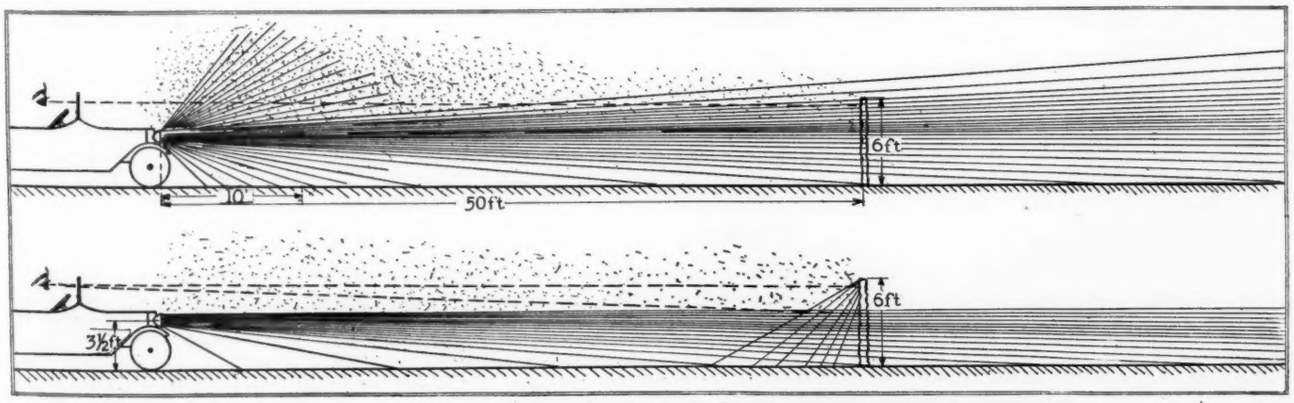
Another advantage of an extended illuminated area is that approaching drivers and pedestrians are much less sensitive to glaring lights when this large illuminated area is in front of them. The brighter the surroundings the more intense must a light be to cause glare. In full sunlight we would barely notice a powerful headlight shining directly in our eyes from a moderate distance.

Having now reviewed the important fundamental principles of good lighting we are ready to consider more specifically the requirements of the automobile. We have to consider here first, the requirements of the driver; second, the drivers



Above—Fig. 2, Plan of light beam with distribution of rays incident on area included within lines A and B

Below—Fig. 1, Elevation of light beam showing angles of incidence on road at distances 20 ft. apart



Above—Fig. 3, Form of beam which glares. Below—Fig. 4, Illumination that is non-glaring

and occupants of other vehicles, and third, the pedestrians on the road, also some special conditions which the machine is likely to encounter. The merits of any particular installation of automobile lighting cannot be judged solely by the ease and comfort with which a driver can operate the car under some particular conditions. The demands of safety under a wide variety of conditions must also be considered. The tendency in passing judgment is to overlook some important points, just as in figuring costs the tendency is to leave out some important items.

First, considering the requirements of the driver, he would be satisfied if he could have daylight or something closely approaching it. Daylight is characterized by a high intensity of illumination of great uniformity and extent. The intensity of average daylight illumination is a thousand times greater than our best artificial street lighting. Such light as this for the automobile is obviously out of the question. It is equally impractical to suggest that all roads traversed by automobiles be provided with street lighting on the same scale as our best lighted city thoroughfares. Even if this were practical it would fail to meet some of the important safety requirements.

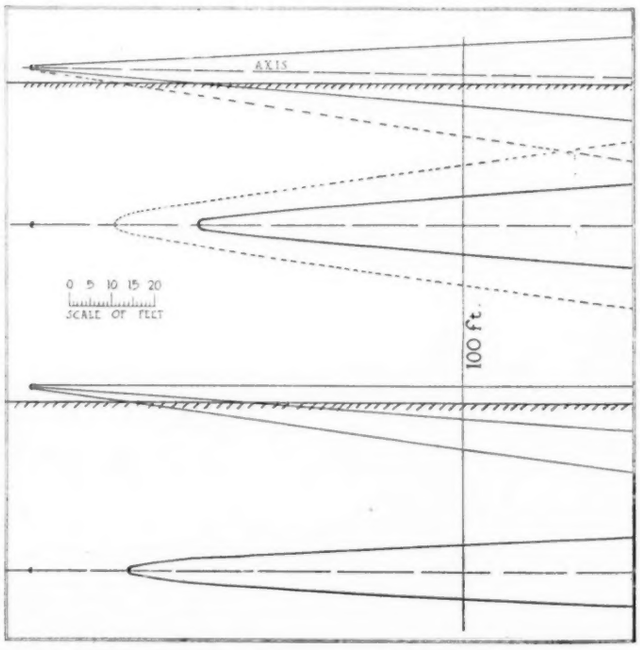
The driver will find it easy to operate the car if the road ahead of him is covered for a considerable distance, say 200 ft., with a strong uniform illumination which enables him clearly to see ruts and stones or any obstacle in his path. This illuminated area should be wide enough to show turns and enable the driver to select the smoothest part of the road. Extra width is also valuable in disclosing landmarks and dangers such as animals wandering along the side of the road which might dash suddenly in front of the car at such close range as to make collision certain. A liberal width of illuminated surface is also advantageous for increasing the efficiency of vision as was mentioned under the characteristics of the eye. Though desirable, we do not have to maintain uniformity over the full width of the illuminated area. The outlying portions will still be very beneficial even if considerably weaker in intensity, but large increase in the illumination in spots and patches over what is necessary to see should be carefully avoided because such spots not only waste light that could be better used elsewhere, but they also cut down the visual efficiency of the eye on the remainder of the illuminated area.

For safety on crossings and rounding curves there is needed a strip of illumination on the surface of the road extending at least 200 ft. in front of the car and with a diminishing intensity extending beyond to 400 or 500 ft. For this purpose the width is not so important but the brightness must be great enough to be easily seen in the presence of ordinary street lighting. This is a particularly important safety measure. Two cars approaching each other at a crossing can see each other's beam of light on the road ahead when the cars themselves are obscured from each other and ample precautions can be taken to avoid a collision. To be plainly visible under various conditions a strength of beam sufficient to give a horizontal illumination of 0.025-ft. candles at 200 ft. should be used. Such a beam will also attract the attention of and warn a pedestrian crossing the street that a car is approaching even when he is not looking toward the car. It will also make the pedestrian visible to the driver if he gets in the path of the car, thus giving a double measure of safety. An illumination on the road such as is described above can in itself harm no user of the road, but will benefit all parties concerned.

The question now arises, How can we secure such an illumination? We cannot space a number of lights along the street as is done in street lighting, for our illuminated area must travel with the car. We cannot even mount units on the car at heights which are customary in good street lighting for we would soon bump into overhead work. We must then produce this illumination from units mounted at some convenient height on the car. (This question of effect of height will be discussed later.) In order that lamps mounted on the car shall produce the illumination mentioned above it is necessary that they direct toward each portion of the surface to be illuminated an appropriate strength of beam, not too strong toward any part or light will be wasted, nor too weak or it will be ineffective. The above specifications call for a very closely controlled distribution of light. In order to show what the general distribution characteristics of the lamps should be in order to furnish the above mentioned illumination, I have drawn Figs. 1 and 2. In Fig. 1 a series of points are laid off every 20 ft. on a line representing the road level and each one of these points is joined to the center of the lamp mounted 3½ ft. high. For uniform illumination it is necessary that equal areas receive an equal amount of light flux. Light flux divided by the solid angle through which it is delivered gives intensity or candlepower. Equal areas more distant from the lamp subtend smaller solid angles, hence the light directed toward the more distant areas must be more concentrated or intense. It will be noticed that the top part of the beam illuminates the more distant sections of the road and therefore must be more intense. The intensity must diminish gradually as we pass to the bottom of the beam.

Referring to Fig. 2, which is a plan view diagram, a strip of road included between the dotted lines A and B is assumed illuminated. Lines are drawn to the lamps from points on the edge of the illuminated area spaced every 20 ft., as in Fig. 1. It will be seen that the lines from the most distant pair of points include the smallest angle, and from the nearest pair the greatest angle. The angle between any pair of these lines represents the sidewise spread which the light directed to the points in question must have to give the desired width of beam. To illuminate the strip shown in Fig. 2, the light must have the least sidewise spread at the top of the beam and the greatest at the bottom and increase gradually from the top to the bottom.

It will be interesting to compute how intense an average illumination can be obtained on the above described area with a size of light source within the limits now in use, when the light is uniformly distributed. The total lumens of light



Above—Figs. 5 and 6, Elevation and plan of beam set to strike road at 250 ft. from lamp

Below—Figs. 7 and 8, Diagrams of beam for same lamp tilted 4 degrees downward

available divided by the area in square feet uniformly illuminated gives the intensity of the illumination in foot candles. Taking the strip 20 ft. wide at the car and 34 ft. wide at 200 ft. in front gives an area of 5400 sq. ft. Assuming two light sources each projecting 20 mean spherical candles, gives $4 \times 40 = 503$ lumens, which divided by $5400 = 0.093$ foot candles, or 1 lux strength of horizontal illumination. Bright moonlight is about 0.25 lux, so the intensity of the illumination above calculated is four times that of bright moonlight.

A 1000-candlepower street lamp mounted 20 ft. high gives a horizontal illumination of 0.079 foot candles, or about 15 per cent less than in above calculation at a distance of 60 ft. This intensity of light will show most road surfaces very clearly and when projected from the lamps on a car will show obstructions on the road with great clearness because the vertical illumination which is effective in illuminating projections is many fold stronger than the horizontal illumination.

To allow for the effect of pitching of the car and to make objects visible beyond 200 ft. some light should be projected from the lamps above the beam striking at 200 ft., although it will not be necessary to preserve the uniformity of the road illumination from here on ahead. If less light is available than that assumed above it will be better to keep a narrow strip down the center of the road up to the intensity calculated to serve as a warning at crossings and let the weakening of the illumination be borne by the sides of the strip. However, it would be better to use more light rather than less.

Avoiding Glare

There is a growing tendency to regulate glare by specifying that no strong beams of light shall be projected above a level of 42 in. more than 75 ft. in front of a car, the measurements to be made on a level road. This is decidedly a step in the right direction in regulating lights. The eyes of substantially every user of the road are well above this level, and it is only when a car pitches on a rough road, thus tilting the beam upward, and when rounding the top of a hill that the beam will shine into the eyes of persons facing the car, and the duration of these flashes will be very short and they will very seldom occur except while the approaching car is at a considerable distance, leaving ample time after the flash to pick out a safe course on the road. No possible adjustment of the lighting can avoid the occasional flash just mentioned and preserve lighting that is either safe or satisfying. At the tops of hills the glare could be eliminated by the installation of very brilliant local street lighting. The flashes from pitching could be remedied by smoothing the street surface.

Frosted Glass Wasteful

It has been suggested that glare be reduced by covering the front of the lamp with diffusing glasses which scatter the light. This is very wasteful and unsatisfactory; it gives a distribution of light which is most intense directly in front of the car and which diminishes rapidly as the distance increases, and is ineffective at a distance. In addition this strong scattered light forms an illuminated curtain which blinds the driver in fogs and in snowstorms. This blinding effect is illustrated in Fig. 3. The dotted line represents the line of sight to a 6-ft. high object in front of the car. The long lines represent a strong beam of 8 deg. spread with the center set to strike the road at 200 ft. The short lines from the lamp represent strong scattered light such as would come from a diffusing glass front or other light scattering means. The particles of fog or snow surrounding the line of sight to an object reflect light back into the eye and prevent seeing the object. Fig. 4 represents how this danger is avoided with a distribution of light in which no strong light from the lamp rises above the top of the lamps set at 3½ ft. The portion of the object above the beam of light is illuminated by the diffused light from the surface of the road. This diminishes very slowly in intensity as we go upward because of the large size of the source.

Illumination by Ordinary Parabolic Reflector

Having described what is desired for good automobile lighting, it will be interesting to examine the results obtained by the ordinary parabolic reflector that has been so much used and point out its merits and its defects.

The ordinary parabolic reflector (See Fig. 13) with the light source centered on the focus gives a concentrated beam of light which is most intense along the axis of the reflector, and which diminishes in intensity as we move away from the axis in any direction. At the edge of the beam the intensity is only a small fraction of the intensity in the center. The distribution is symmetrical about the axis. The angle of spread of the beam is approximately equal to the largest angle which the light source subtends from any point on the reflector.

The spread of a beam varies with the size of light source used. A mathematical point would give no spread, that is, it would give parallel rays. But it must not be overlooked that a mathematical point would also give no light.

Focus Affects Beam

Drawing the light source either forward or back of the focus increases the spread of the beam and also greatly reduces the intensity of the center of the beam. If the light source is moved sidewise from the focus, the center of maximum intensity of the beam moves in the opposite direction.

Fig. 5 represents the beam from a parabolic reflector having an 8-deg. spread mounted 3½ ft. high and set with the axis of the beam striking the ground at 250 ft. The full lines in Fig. 6 represent the intersection of this conical beam with the ground, the area inside the full lines is illuminated by the beam. The beam strikes the ground 38 ft. in front of the lamp and does not have a sufficient width to give good results until a distance about 90 ft. in front of the car is reached; beyond this distance the illumination is sufficient. The beam is high enough to glare beyond 30 ft., so this is not "no-glare" lighting.

Light Lost by Tilting Lamp

Fig. 7 represents this same lamp tipped down 4 deg. below the horizontal so that the top of the beam is horizontal. The center of the beam then strikes the ground 50 ft. in front of the lamp, producing a very bright elliptical-shaped spot of small width. The edge of the beam strikes the ground about 22 ft. in front of the lamp. Fig. 8 is a plan view of the intersection of the beam with the road. The intensity of the road illumination diminishes rapidly beyond the 50-ft. point, and its effectiveness dies off even more rapidly because of the presence of the very bright area around the 50-ft. point. This lighting has just one merit—it does not glare. Its defects are: First, too dim at a distance; second, too narrow everywhere; third, too great inequality in intensity.

Spreading the beam to reduce the intensity of the spot requires that the lamp be tipped more to avoid glare, thus bringing the axis nearer the car and still further lessening the effective distance of the illumination already too short. Tipping the ordinary parabolic headlight as a solution of the automobile lighting problem can be dismissed as absolutely unsatisfactory.

To show definitely the distribution of illumination produced on the road by a representative parabolic reflector and the change produced in this illumination by tilting, I have prepared some carefully computed illumination curves based upon the distribution curve of a standard make of 9-in. parabolic reflector of 1¼-in. focal length with a 20-candlepower 6-volt bulb.

These (on the page opposite) represent the distribution of intensity of illumination on the road. The full line curve with the center of the beam pointed to strike the ground at 200 ft., the dashed curve for the beam tilted down 4 deg. from the horizontal or with the center of beam striking at 50 ft.

Curves Show Illumination

Two curves are drawn for each setting of the lamp, one representing the illumination as measured normal to the beam, the upper curve, the other the horizontal illumination to which the brightness of the road surface is proportional. The normal illumination at any point is always greater than the horizontal, when the beam strikes the ground obliquely as is the case in automobile lighting.

Considering first the horizontal illumination with the 200-ft. setting, there is a very dimly lighted space between the 20-ft. and 40-ft. point. Beyond 40 the illumination is good, reaches a maximum of 0.17 foot candles at 80 ft. and falls gradually to 0.023 at 200 ft., which is equivalent to good moonlight; beyond 200 ft. the illumination gradually dies away. It is to be noted that the normal illumination which comes into play in illuminating a projection or obstacle on the road is still high at 200 ft. and for a considerable distance beyond.

Consider now the horizontal illumination curve of this lamp tilted 4 deg., which is necessary to bring it to a "no-glare" position. There is a dim space at 20 ft., but from there on the illumination rises, rapidly reaching a maximum at 40 ft., which is eleven times the maximum of the 200-ft. setting. It falls rapidly from this point, becoming ineffective beyond 80 ft. The normal illumination also falls off rapidly and is ineffective beyond 115 ft. This illumination is very bad because of its great and abrupt variation. The area covered with sufficient intensity is small and the visual efficiency of the eye is much reduced both on account of the small area and because of the enormous and abrupt variations in intensity.

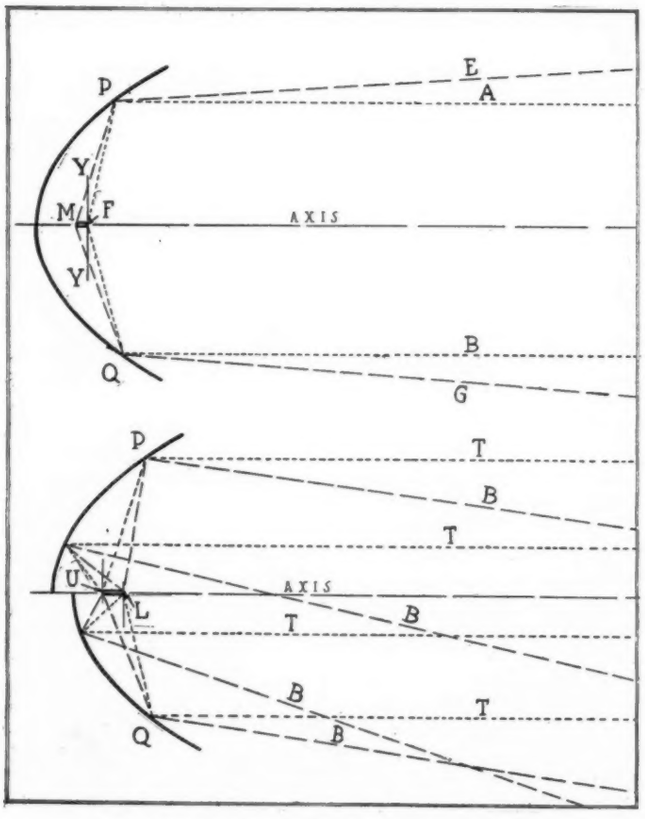
The right hand curves of illumination for the two settings just mentioned, are taken at various distances across the beam. They form a sort of topographical map of the illuminated surface of the road for the two cases.

These curves show that the same enormous increase in variation that existed lengthwise of the beam in the 4-deg. tilt curve also exists across the beam, and the effective width is thereby reduced.

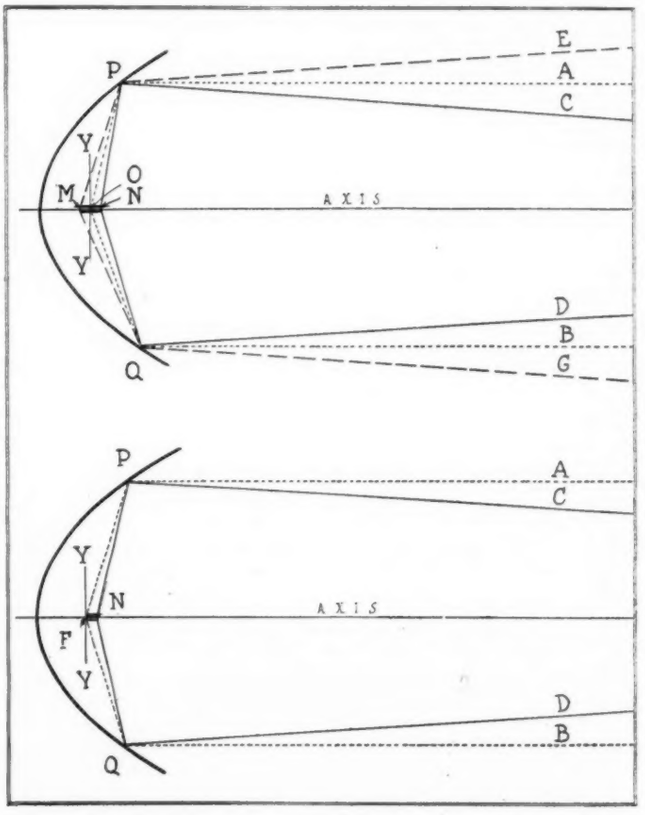
Improved Modifications of Parabolic Reflector

I will now describe how the plain parabolic reflector may be modified to give a more suitable distribution that may at the same time be so directed as to be free from glare. First let us examine more minutely the action of a parabolic reflector. Considering Fig. 11, this represents a section through the axis of a parabolic reflector with a cylindrical filament *MN* centered on the focus *O*. Rays from the focus *O* striking the reflector surface are reflected parallel to the axis, as represented by *OPA* and *OQB*. Rays coming from any other position are reflected at an angle to the parallel ray, which is equal to the angle between the incident ray and the incident ray from the focus to the same point. This follows simply from the law of reflection that the angle of reflection from a mirror surface is equal to the angle of incidence on the mirror.

Thus in the figure the angle *EPA* equals angle *MPO*, also $CPA = NPO$, $GQB = MQO$, and $DQB = NQO$. Similar relations hold for light from any point in the source striking any point on the reflector. It is thus seen that the beam from a reflector is made up of an infinite number of these diverging cones of light coming from all points on the reflector. It will be noticed that light rays coming from points on the filament that are in front of the focus converge toward the axis, and from points behind the focus diverge from the axis. The beam of light from this reflector thrown on a screen will have a distribution of intensity represented in Fig. 13, strongest in the center and diminishing toward the



Figs. 9 and 10, showing effect of dividing reflector



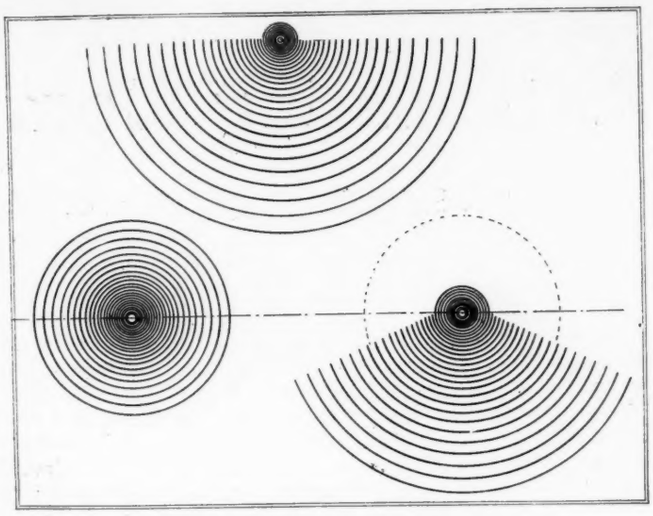
Figs. 11 and 12—Effect of position of filament relative to focal point

edge. If the reflector is viewed from a point in this beam not too close to the edge its whole surface will appear brilliant because each point of the surface is sending out a little cone of light which strikes the eye.

If now the half of the filament in front of the focus is removed we have the condition shown in Fig. 9, where all of the little cones of light diverge from the axis, the innermost edges of the cones being parallel to the axis. This beam thrown on the screen would be very similar in light distribution to the beam thrown by the last described adjustment; it has the same spread, that is, covers the same area, but since half the light source has been removed, it is only of one-half the intensity. It we put our eye in this beam a little to one side of the center and view the reflector only one-half of it is bright, and that is the half on the same side of the axis that the eye is placed. The little cones of light all spreading away from the axis do not cross it and strike the eye.

If instead of the front half of the filament we remove the half back of the focus, Fig. 12, all of the little cones of light will converge toward the axis and cross it and diverge from it after crossing. When thrown onto a screen this will give a spot very similar to the one just described, except that it is smaller by the diameter of the reflector (which fact is of small importance in automobile work). The important difference is that when the reflector is viewed as before from a point in the beam a little to one side of the axis, the opposite half of the reflector is bright, and the near half dull. Thus in Fig. 19 the reflector viewed from the point *D* would appear bright on the lower half.

With the filament extending equally on both sides of the focus the cone of light from each point on the reflector spreads equally in all directions from the axis, and if we were to remove any portion of the reflector surface we would simple cut down the intensity of the beam as a whole, but would not change its shape. But with all of the filament to one side or the other of the focus the little cones do not all superpose, but each occupies a definite position in the beam. We can then change the shape of the beam by removing certain of these constituent cones. If, for instance, we take half of the reflector away we have a beam which gives a spot like Fig. 15 without the little hump at the top. This same shape is given with one-half of the reflector with either of the filament adjustments shown in Fig. 9 or Fig. 12. This type of beam has its maximum intensity on the axis and diminishes as we go from the axis outward radially in any direction below the horizontal plane through the axis. Above the plane through the axis the light is nearly all suppressed, since it came from that portion of the reflector that has been removed. It is possible to make the hump that extends upward in Fig. 15 larger by moving the filament toward the focus so that it overlaps the focus more.

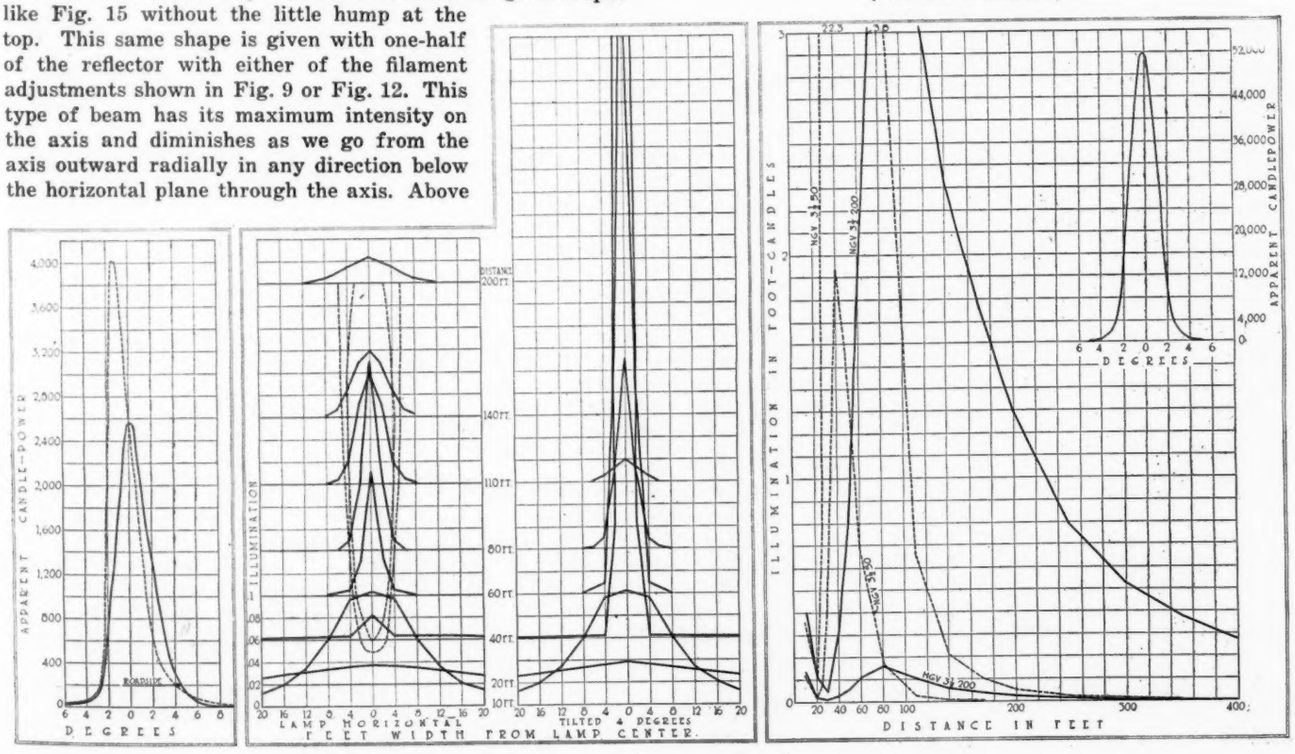


Figs.—Left 13—Right 14—Upper 15

Gives Ideal Illumination

This type of beam gives a closer approach to the ideal distribution desired than any other available. When pointed so that the axis strikes the ground at about 200 ft. and with a center hump large enough to reach up to a 3½-ft. level. The beam gives a broad strip of fairly uniform illumination extending clear back to where direct light from the bulb filament is effective. (This is assuming that the lamp and the filament used are designed to give the proper spread for the mounting height used.) There is no beam light in the glare region above 3½ ft.

(*To be concluded*)



Illumination curves for horizontal and tilted lamps mentioned on page 414

Anticipating Complaints in Service*

A Scientific Application of Service Experiences to the Prompt Betterment of Production

By F. A. Cornell

INDIANAPOLIS, IND., Feb. 26—How the engineering department of a motor car factory can utilize the complaints which come into the service department to the best advantage in designing new models or making minor changes was explained to the Indiana Section of the Society of Automobile Engineers at the Claypool Hotel last night. This explanation was embodied in a paper presented by F. A. Cornell of the Perfection Spring Service Co., who for a number of years had charge of the service department of the Willys-Overland factory, Toledo, Ohio. Although the title of the paper, "Anticipating Complaints", is the correct one, there undoubtedly would have been a larger number of the engineers in attendance had the author adopted some such title as "How Factory Engineers Can Capitalize on Kicks."

As it was, the service departments of the Indiana car and accessory factories were much better represented than were the engineering departments, a regretable feature inasmuch as both the paper and the lively discussions thereon were full of suggestions and inspirations for the prompt betterment of factory production.

During Mr. Cornell's experience in service and sales work he has developed a plan by which complaints on account of wear and breakage and other difficulties can be charted and segregated by the service department, to convey to the engineering and sales departments exact and immediate information as to the cause and seriousness of any wrong design or materials and show what changes in design, inspection, specifications or factory processes may be needed to correct the fault and thus make sure that the same error is not carried through in later production. The paper (slightly abridged) follows:

The first and easiest step is to build up a complaint system. Through some convenient but invariable path all criticisms should be cleared, analyzed, tabulated, and reported to all interested departments. Grouping of such complaints under several general divisions of car lay-out is too generally used to require further explanation.

But the immediate and vigorous study of these reports is more often from commercial than technical sources. Possibly it seems beyond the reasonable to expect a capable engineer to give ready heed to comments that are so often unfair, and so very seldom thorough. But the fact remains that a Complaint System usually requires the vigorous insistence of a commercial executive before real action is taken.

However, the Complaint System should be retained and supported by another method that introduces mathematical analysis. Possibly all the necessities for replacements might be divided between two general causes: (1) The wear, or (2) the breakage of individual parts. These may be subdivided as falling in one or another of four groups, by the cause of the damage. In further detail these four groups might be adapted to more exact usage along the lines of the following:

Not a single operating engineer might agree exactly with the classifications suggested. They are not offered as a working scheme that should be put into use at once in this form. It is hoped, however, that many such distributions of service damage are now employed. To such executives, this paper will offer a broad opportunity for constructive discussion. To all builders in the world of mechanics this message cannot go far astray: "Get scientifically close to the proofs of your pudding."

Causes for Replacement

Worn (W) or Broken (B).

1. *Inherent Defects.*
   - (*a*) Flaw in Texture.
   - (*b*) Error in Alloy.
   - (*c*) Early Crystallization.
   - (*d*) Wrong Material Specified.
2. *Manufacturing Irregularities.*
   - (*a*) Wrong Material Used.
   - (*b*) Incorrect Treatment.
   - (*c*) Error in Machining, etc.
   - (*d*) Improperly Assembled.
   - (*e*) Lack of Thorough Inspection.
3. *Damaged in Normal Service.*
   - (*a*) Failure of Associated Mechanism.
   - (*b*) Adjusting Assembly not Reasonably Permanent.
   - (*c*) Insufficient Provision for Lubrication.
4. *Damaged in Abnormal Service.*
   - (*a*) Lack of Reasonable Lubrication.
   - (*b*) Lack of Reasonable Adjustment.
   - (*c*) Driving Accident.
   - (*d*) Unusual Driving Damage.

It is true that a tabulation of *all known* replacements offers only an indication of efficiency. Mathematical accuracy could be had only by analysis of *all* replacements. But the repeated contributions of "the kicker" offer opportunities that should be improved as scientifically by the technical departments as they are concluded diplomatically by the selling staff.

The primary point of this paper is to indicate that more attention has been given toward seeing "the kicker" satisfied than in being scientifically certain that each possible cause for complaint is quickly corrected. Let us illustrate how such purposes may be accomplished by sketching the development of a quantity producer's efforts. His scientific scheme was disguised as a game. Even the day laborers became interested in the fluctuation of a "Parts Batting Average."

Developing the System

Each piece returned for replacement or repair was carefully inspected. The cause leading to its condition was reported by the code of our brief (such as W2c, advising the recording and corresponding clerks that the part was worn through an error in machining and therefore in line for free replacement).

It should be noted that those causes that were up to the car owner are listed last as Group 4. It was the plan to exhaust the possible application of any of the rulings under 1, 2 or 3 before refusing credit on the grounds that the factory was not to blame for the damage. It is imperative that fairness be maintained, but that in any case of doubt the customer should be given the benefit and that the manufacturer should carry such doubts as reason for careful watch and study.

This is as far as the ordinary system goes. Now for the "Batting Average." On a proper form, such replacements were tabulated by part numbers. The sub-totals may be taken to show repeti-

*A paper presented at Indiana Section S. A. E., Feb. 25, 1916.

tions from individual causes. But, better than all, the entire replacements of a part were computed against the total production of that model to the first of a prior month. Should 1200 cars have been delivered up to May 1, and if 12 transmission countershafts, No. 4901, had been replaced up to June 1 of the year, the efficiency of that piece was 99 per cent, and this was shown in the last column of the form.

The Score Board

Such percentage figures make fine information, but more was wanted than to know. A blackboard was placed where the men congregated and the parts leading in non-efficiency were listed thereon in the order of their disfavor. Associated departments soon vied with each other in efforts to excuse the humiliation of leading the list. The jeering remark, "You fellows have a lot of heavy hitters this week," did more to clean out the weaklings than any one other scheme.

Group 1 covered causes within the selection of materials, usually applying to outside suppliers. Group 2 covered errors properly chargeable to a factory department. Group 3 to the engineers and Group 4 to the user. The service department, with sales co-operation, constantly strived to reduce the replacements due to causes within Group 4 by vigorous educational efforts.

But even the "batting averages" and the "score boards" seemed to have limitations. Final and most intensive application of all service experiences was not obtained until the breakage was plotted. This was the effective step *in anticipating complaints*, since the relative efficiency of associated parts was so graphically shown.

The Service Curve

A great many successful enterprises have been developed upon the principle, "the customer is right." While some merchants seem to disagree with so broad a policy there will be a few so stubborn as to deny that many purchasers having a just complaint do not present it to the vendor. Most men want to live agreeably.

It is, therefore, easily possible for some serious faults to go along unchecked unless all the known sources of complaint are tabulated and analyzed. The best trade connections would far rather send in orders than complaints. When they do find fault it is often from just causes that might have been quickly corrected by scientifically cultivating "the kicker."

A careful plotting of a service curve, a broad belief in the fairness of humankind, and a vigorous determination to be sure that we are not at fault before blaming the buyer—all these will go far toward the perfection of car design. The purpose of this paper is to suggest the application of simple and convenient figures as a stimulant to correction before a wide harm is done.

Discussion of Cornell's Paper

Discussion of the paper was opened by E. T. Klee, service manager of the Stutz company who agreed that a system similar to that outlined by Mr. Cornell would be valuable in assuring co-operation between the service and engineering departments, particularly in large organizations where the two departments did not come in contact frequently.

It was the opinion of E. M. Elliot, general manager, Mais Motor Truck Div., Premier Motor Corp., that the chief problem was to make the management of the concern appreciate the truth of the findings of the service department. It was his belief that the service manager ordinarily was made the "fall guy" to placate the owner who complained of mistakes made in other departments.

George A. Weidely of the Weidely engine company, stated that the problem was to get the data in such shape that the management will pay attention to it. He thought that if it was presented in the way outlined in the paper, that it would get attention, and that such a system would go as far as anything to make the American motor car a better car.

Thinks System Good

R. H. Combs, consulting engineer and general traffic manager Prest-O-Lite company and secretary of the section, gave it as his belief that a system such as that outlined would have the desired effect; that this co-operation between the service department and the other departments of the factory was a matter of evolution and will work itself out as the industry grows. The service department was brought into being to relieve the management and the engineering department from complaints, and these departments did not realize the value of the service department from the engineering standpoint.

Service Manager Drew of the Nordyke & Marmon Co., stated the need of appealing to the head of the organization through the expenses of the service department, that it is easier to reach the management through the pocket-book than any other way. He was in favor of a classified accounting system, so as to show the value of the department as a business, distinct from the new car business. He stated that many factories now lump the appropriations to be spent in service work and the accounting is guesswork without any method of knowing the returns from the service department. The expense feature could be worked out showing the cost of each of the various items.

He suggested that a feature that should be taken care of in such a system outlined by Cornell was the analysis of complaints which did not refer to defective parts. This might include such as the construction of the top, or the windshield, or the body design. He quoted Alvin McCauley in the statement that the advertising department has a very close relation to the service department in that the service department must make the car live up to the claims the advertising department has made for it.

Elaboration Suggested

Mr. Cornell suggested an elaboration of the system or rather an extension of its use by which the sales department could tabulate the complaints by territories and thus develop a system for determining what dealers expect too much service attention, such as getting road men to make minor adjustments which the dealers should take care of themselves. This he believes would be of value to the Sales Manager in determining the character of his distributors and dealers.

Commenting on the relation of the advertising and service departments, Mr. Cornell stated that the ideal arrangement was that in force in the Stearns organization when one man was both the advertising manager and service manager. He warned the service men not to rely too much on the dealers' reports, because these were likely to be biased and frequently not made by men of sufficient technical experience to determine whether or not a complaint was just.

He also suggested that it was possible by the system he outlined to put up a danger flag in case there was something radically wrong with a certain part, and thus correct it in a hurry. The service department should take as much pride in getting a complaint as the salesmen do in getting an order.

Asked by Secretary Combs what was done in case broken parts were not returned, the speaker stated that some concerns had a parts auditing service in which traveling auditors examined and passed on defective parts turned in to the dealer and at the same time assisted them in maintaining their parts stock.

Eliminates Mortality

David Landau, consulting engineer of the Sheldon Axle & Spring Co., said that the service department system eliminates the mortality of parts in the new design, and asked upon what basis the efficiency of parts was calculated. That is, what should be the assumed life of a part, or life of a car. In answering this, Mr. Cornell said that the effort was toward making a replacement of parts as nearly constant as possible, that is, in having one part come in for replacement no oftener than others. It is to be assumed from this that Mr. Cornell had as an ideal car one in which no one part wore out quicker than another, and that when it failed, it failed completely like the classic "One-Hoss Shay."

The FORVM

THE QUESTION OF INFLATION—COULD STANDARDIZE BODY DIMENSIONS—GRANT SIX CONFORMS TO AUTOMOBILE'S SUGGESTED PROPORTIONS

Relation of Load Per Wheel to Tire Inflation

By Charles E. Manierre

SINCE the recent publication in THE AUTOMOBILE of my letter advocating the use of oversize tires, a paper by P. W. Litchfield, in the transactions of the Society of Automobile Engineers of 1915, has been called to my attention. Mr. Litchfield, among other things, speaking of the advantages of the oversize tire says:

> "The average car owner never knows what good tire service is until he equips his car with tires one or two sizes larger than those furnished by the manufacturer. Punctures disappear like magic, premature tire wear and carcass failure become things of the past, and riding similar to that of a Pullman car is afforded."

His paper further emphasizes the saving of expense to owners through the use of such tires, and in passing he calls attention to the diminishing liability to puncture as the size of the tire increases.

Incorporated in his paper is a table somewhat similar to that incorporated in the letter of Mr. Parsons, to which I referred in my recent communication. This table gave the proper tire inflation in pounds for tires from 3 to 6 in. in section diameter, and for each section diameter and inflation pressure the corresponding suitable weight to be carried by each rear tire, the rear tire apparently being chosen as having more strain upon it, due to the driving effort, and therefore the inflation suitable for it would be perhaps a trifle more than sufficient for the front wheel.

The table of Mr. Parsons was arranged on the basis of a load per wheel in even hundredweights of 112 lb., for cord tires of various cross-sections, and consequently as to some of the sizes the pressure figured up to odd pounds, e.g. 32, 44, 56, etc. It chanced, however, that for the 3½-in. tire and the 6-in. tire the inflation in pounds increased in multiples of 5, e.g. 30, 35, 40, etc., as in the table of inflation pressures contained in the paper of Mr. Litchfield.

The earlier paper had to do with cord tires, and a comparison of the two shows roughly that allowance in Mr. Litchfield's table, in the smaller sizes, was from 33 to 50 lb., and in one instance nearly 100 lb., less of indicated carrying capacity per wheel, while in the larger sizes, particularly the 5-in., the carrying capacity was as much as 100 and more pounds greater than that indicated in the earlier table. While again, in the 6-in. size the two tables did not differ more than 20-40 lb.

However, these differences rather emphasize the fact that the independent tables had arrived at conclusions not very dissimilar.

The later table indicated the most satisfactory working load and pressure as follows:

In.	Lb. Pressure	Lb. Load Per Wheel
3½	50	515
4	60	750
4½	65	975
5	70	1225
5½	75	1500

It is to be noted that the weight includes both passengers and baggage.

Mr. Litchfield further states that a tire should be reinflated when it has dropped 20 per cent below the recommended pressure. Also that the increase in pressure in a tire on a hot day does not very materially increase the pressure in the tire, but on the contrary that when a tire is pumped up by an engine-driven pump, by which I assume that a spark plug pump is intended, the heat of the air may increase the pressure from 15 to 20 lb. above what would be normal and that with such pumps the pressure ought to be tested an hour after the pumping has been completed.

It is evident that with a touring car, the passengers on the rear seat of which sit directly over the rear axle, a reduction of 10 lb. in pressure might ordinarily be made between the use of the car with the rear seat unoccupied and with the car loaded to its normal capacity, this difference making considerable difference in the comfort of those occupying the front seats on an extended trip. While on the contrary, if all of the seats were to be occupied on some occasion, prudence would suggest a test of the rear tires to make sure that they were properly inflated for the extra load.

Proper Sizes and Inflations

Roughly speaking, it would appear that a 3000-lb., five-passenger touring car should have 4½-in. tires inflated to 60 lb. For a 3600-lb. seven-passenger touring car, the 5-in. tires inflated to 70 lb. For a 4700-lb. seven-passenger touring car, 5½-in. tires inflated to 75 lb., and for a 5500-lb. seven-passenger touring car, 6-in. tires inflated to 75 lb.

No inflation above 75 lb. was recommended, although the carrying capacity of a 6-in. tire inflated to 100 lb. was given as 2280 lb. per wheel.

The Half-Inch Difference

It may be worth while for the reader to consider that when an automobile tire is in place on the machine it carries its share of the gross weight on a flattened section against the ground. This flattened contact with the ground is the shape of an elongated oval, possibly 2 in. wide by 6 in. long, more or less. If the weight sustained by the tire is 800 lb., the oval may have an area of approximately 10 sq. in., and the tire would then be inflated to 80 lb. pressure. In other words, each square inch in contact with the ground would be pressed upon by the earth to the extent of 80 lb., and on the other side, by the weight of the car exerted through the air pressure in the tire to an equal amount. The importance of an additional half inch in tire section is then readily apparent. It will amount to widening the flattened contact substantially the whole additional half inch along the whole of its 6-in. diameter, i.e. 3 full square inches. With 80 lb. pressure this amounts to 240 lb. per wheel, or 960 lb. of added capacity for support for the whole car. The extra ½ in. does not seem much at first thought, but worked out in this way its true

importance appears. It also becomes more apparent why a lower air pressure and not a higher air pressure should be used with a larger tire. To produce substantially the same length of flattened oval, the 800 lb. assumed weight on the wheel is to be divided by 13 instead of 10, and the corresponding pressure would be approximately 60 lb.

Using Old Rear Tires in Front

Mr. Litchfield was not specific as to the increased mileage to be obtained by use of oversize tires, but as he speaks of removing from the rear wheels tires which are "almost worn out" and says that they may be run on the front wheels several thousand miles, it is evident that the mileage must be greatly increased. My own very limited experience indicates that it is not less than two or three times that guaranteed by the manufacturer. Of course it is assumed that the driver is reasonable in the use of his brakes and in his speed.

Some years ago it was generally customary for automobile manufacturers to set forth in connection with other details of their cars the weight of the car, but I understand that as there was no standard as to what the word "weight" meant the practice was discontinued, and that the S. A. E. is considering the standardizing of a definition as to weights, which will enable the manufacturers again to state this interesting detail. As a matter of fact, due to additional mechanism and particularly the electric starting systems, the average car for a year or two increased considerably in weight. Attention is again being turned toward the effort to reduce the weight as far as practicable.

Weight Is Important

The weight of the car is, however, as much a matter of interest as the dimensions of the bore and stroke of the engine. It is something which every intelligent purchaser wants to know and which every automobile salesman has at his tongue's end, if asked. A few cars now give prominence to the matter of weight in their advertising. It is to be hoped that this is the beginning of a return to the general stating of that very important item of information, without which it is quite impossible to intelligently consider the matter of the size of tires and the question of the advisability of the use of the oversize.

In conclusion perhaps it should be said that the standard rims admit only the placing of one size of tire and one oversize of tire on the same rim. If the weight of the car is such as to demand anything greater than the oversize, or if it is such that the maker has placed upon it the oversize tire, the only remedy will be the equipping of the wheels with rims suitable to the larger tire. What the diameter of such a tire would be will depend upon the diameter of the tire seat. A 32 by 3½ tire has a rim of 25 in. in diameter. If the oversize 33 by 4 is not sufficiently large then a rim for 34 by 4½ will fit the same seat.

Gross Carrying Capacity of Goodyear Tires—In Pounds, Per Tire

Infl. Press.		Tire Section Diameter						
Cord	Fabric	3"	3½"	4"	4½"	5"	5½"	6"
27	30	250						
32	35	290	360					
36	40	335	410	500				
41	45	375	460	560	675			
45	50	415	515	625	750	875	1000	1140
50	55	460	565	690	825	960	1100	1255
54	60	500	615	750	900	1050	1200	1370
59	65		670	815	975	1135	1300	1480
63	70		720	875	1050	1225	1400	1595
68	75			940	1125	1310	1500	1710
72	80			1000	1200	1400	1600	1925
77	85				1275	1485	1700	1940
81	90				1350	1570	1800	2050
86	95					1660	1900	2165
90	100						2000	2280

Before pressure drops 20 per cent tire should be reinflated.

This table shows the carrying capacity of Goodyear tires, both cord and fabric, and the proper inflation pressures for any given load. Instead of specifying a certain pressure for different sized tires, the scale provides a pressure adjusted to the load the tire carries.

A 32 by 4 has a seat diameter of 24 in., which unfortunately cannot be mended. With a 34 by 4 the seat diameter is 26 in., and a change to a larger tire than the oversize will require 36 by 5.

Information respecting these rim sections is given in THE AUTOMOBILE for Nov. 25, 1915.

Loads and Inflations

It seems probable that with the gradual increase of information among automobile drivers as to tire inflation the tire companies will find it practicable to change their method and to issue generally a scale of inflations suitable for various loads. This doubtless would require the action of the S. A. E. in standardizing such a scale, and it will probably be the end of guaranteed tire mileage, for the excellent reason that anyone who cared for the preservation of his tires and adopted the suitable size and inflation would invariably so far exceed the guaranteed mileage as to make the guarantee a matter of entire indifference.

Under this new régime tire troubles and expense would cease to hold the prominent place they now have in the minds of automobile owners.

—

Standardized Body Design Is Possible

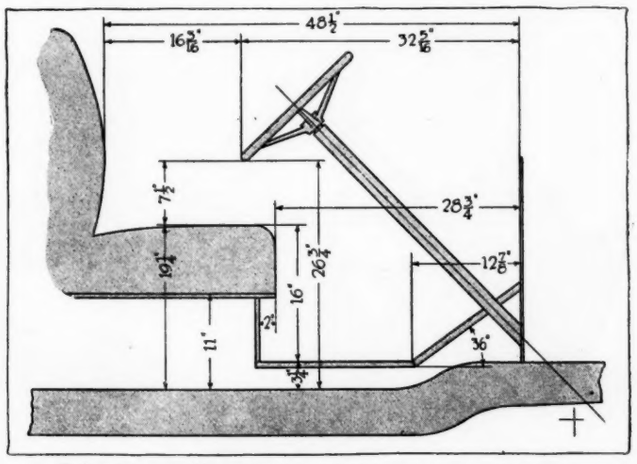
By H. L. Kupel

Bartholomew Co.

THE writer believes that the article in THE AUTOMOBILE for Feb. 3 is very timely as comparatively little attention has been paid to comfort in the past.

The various dimensions as given in the table in this article seem to work out very well after checking them over with our own car, but one dimension which is very important has been omitted, namely, the depth of the front cushion. The writer thinks it is the distance from the front seat back to the pedal that is of prime importance, and we find that for an average person the distance from the front seat back to the edge of the front cushion should be about 17 in. and the distance from the front edge of the seat cushion on a horizontal line to the pedal should be 19 in., as shown in your table. If, however, the front cushion is made of less depth, then the distance from the pedals to the edge of the front cushion should be greater.

I thoroughly agree with Mr. Schipper in the conclusions he has reached in the dimensions that should be maintained, and I think that a front compartment of a body so built will fit almost any ordinary-sized person. The dimensions in the table also are of such a nature that they will permit of slight modifications in order to conform to the peculiarities of certain body designs.



Driver's seat dimensions used for Pierce-Arrow bodies

Good Proportions on Grant

By Jas. M. Howe
Chief Engineer Grant Motor Co.

WE have read Mr. Schipper's article printed in your issue of Feb. 3 with a good deal of interest, and are inclosclosing our corresponding dimensions of the Grant six.

You will see in the main that these dimensions agree fairly close with those recommended. The noticeable variations being that both our front and rear seat heights are carried 13 in. instead of 14 in., using comparatively soft cushions.

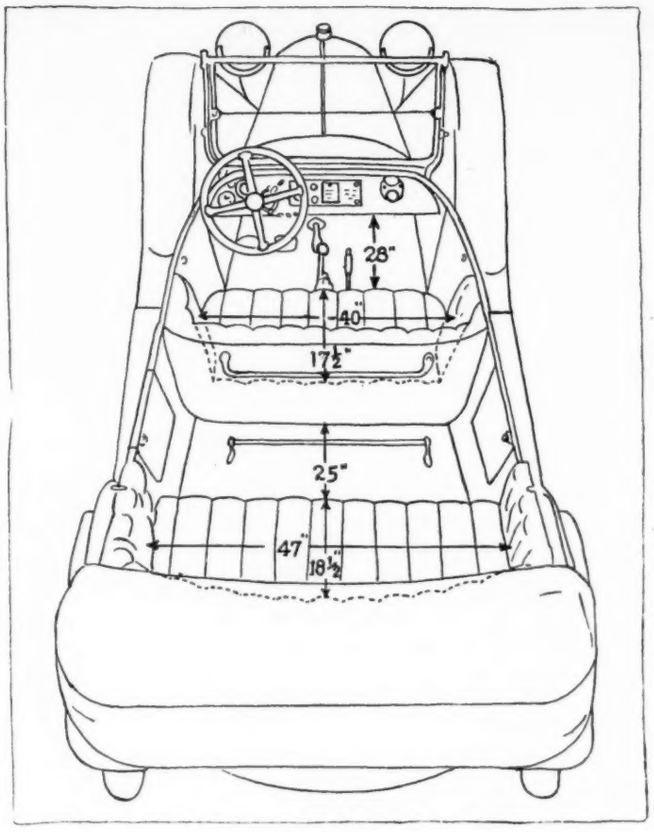
We believe that on a car of our size that 19-in. doors such as we have are ample. With this door we are able to secure a full door without cutting off the rear corner to clear the fenders. With a small six every inch in the length has to be watched very closely so that the space is employed to the best advantage. We have been able to hold our hood length down to 30½ in., which with our bull-nose type of radiator gives us the much-desired long hood appearance as well as a large body with this wheelbase.

In fixing the body dimensions we always set up a dummy and shift the various dimensions until the most comfortable position is obtained, striking a happy medium between the room required by a 6-ft. driver and a small woman. We find we are able to do this very nicely with the exception perhaps of our pedal distance. This is easily taken care of by an extension on the pedal, the other dimensions being comfortable for any size of driver.

There are a number of cars on the market to-day which the writer, who is over 6 ft. tall, is unable to drive with any comfort, the variations in dimensions being very clearly emphasized in the dimensions of the twelve cars that Mr. Schipper has checked up.

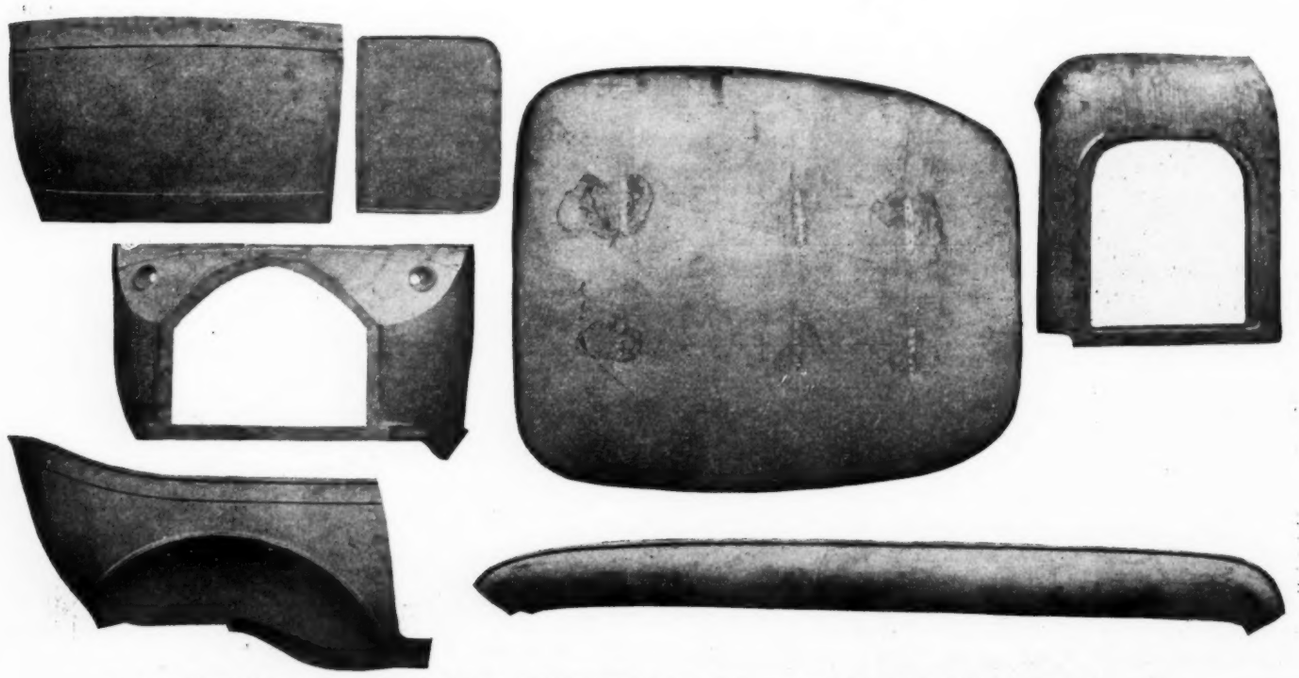
It has been our experience that a 21 in. or 22 in. depth of rear seat is too great, as a small person finds such a width uncomfortable. A good deal, of course, depends on exactly how the back is trimmed, but we favor the width of the rear seat not to exceed 19 in. or 20 in. The correct position we believe for the driver is leaning slightly back; the cushion should fit well in the small of his back.

In a number of cars the control levers are altogether too close to the front seat.



Proportions of Grant six

On the whole we feel that your recommendations as to dimensions are well chosen for comfort. With our dimensions we are able to employ the same chassis, with the exception of the rear springs, for our touring car, roadster and cabriolet, the driver's seat in the cabriolet and roadster being at these dimensions, while the seat for the other two occupants are shoved toward the rear 4 in. This works out nicely for three people.



Cast aluminum parts of the new Cadillac coupé body mentioned in The Automobile for Feb. 24

The Rostrum

More About Electrified Chamois Funnels

EDITOR THE AUTOMOBILE:—Considerable interest has been aroused among motorists by the publication of an article to the effect that the action of straining gasoline through a chamois generated a charge of static electricity sufficient at times to ignite the gasoline and cause disastrous results; and this article has been reprinted and given wide circulation by one of the automobile insurance companies.

In the interest of Marmon owners, the Service Department of Nordyke & Marmon Company have had this situation thoroughly investigated, and eminent authorities seem to agree that there is nothing whatever in the report that passing gasoline through a chamois generates an electrical charge.

In this connection, the report from Arthur L. Foley, head professor of physics at Indiana University, is of interest. Professor Foley writes as follows in answer to the Nordyke & Marmon Company's inquiry:

"Pouring gasoline through a funnel with chamois strainer does not of itself produce a charge, and it makes no difference whether the funnel is supported by a person or by the gas tank. The article is in error in saying that the funnel is grounded when in the tank, and insulated when in the hand. If there is insulation in either case it is more likely when the funnel is in the tank, as the car stands on rubber while the man usually does not.

"As a matter of fact there would be very rare cases, indeed, when both were not grounded for potentials sufficient to produce a spark. But on a day when the atmosphere is very dry as it is unsually on a cold, clear day, a man may become charged by scuffling about on a clean, dry floor, or his clothing may become electrified by friction, as noticed sometimes when combing the hair.

"Under such circumstances pouring gasoline through a funnel, whether or not there is any chamois in it, gives rise to induced charges that are quite too complicated to undertake to explain in a few words. Such charges might fire the gas. Indeed the original friction charge might do so under certain circumstances." P. F.

Indiana University.

Grant Six Dimensions

Part of Car	Key Letter on Chart	Dimension, Ins.
Wheel to front seat vertically	A	8½
Wheel to seat back, horizontally	B	16¼
Front seat, height, vertically	C	13
Shifter to seat, horizontally	D	7
Center of wheel height, vertically	E	27
Pedal to seat, horizontally	F	19½
Shifter level handle height	G	16
Brake lever to seat, horizontally	H	14
Level line of eye and wheel top	J	Over
Must one lean to shift gears	K	No
Must one lean to apply emergency	L	Slightly
Width of front door	M	19
Position of driver in seat	N	Slightly backward
Transverse distance sill to shifter	O	17
Transverse distance sill to brake	P	21
Width of front seat for driver only	Q	20
Entrance space between wheel and side	R	10
Front seat back to rear seat	S	29
Height of rear seat	T	13
Depth of rear seat	U	19
Width of rear seat	V	47
Width of rear door	W	19

Table of Grant six body dimensions which are mentioned in letter from Jas. M. Howe on opposite page

Reboring Cylinders Adds Life to Motor

Editor THE AUTOMOBILE:—I have a 1910 Hudson 20 motor number 1690. It has been thoroughly overhauled, all new bearings in motor with new helical timing gears. What is the make of this motor?

2—I would like your advice on reboring or regrinding cylinders and fitting now pistons.

3—I have never used a self starter but would like electric lights that will stand up while on or in use. Kindly give your advice on generator, etc.

I have used this car several thousand miles with very satisfactory service and I am rather attached to it and do not care to sell or give it away. C. B. F.

Brooklyn, N. Y.

—This motor was made by the Atlas Engine Works, Indianapolis, Ind. Any new parts for it can be secured from the Hudson factory in Detroit.

2—This would no doubt be worth while if the other parts of the car are in good condition.

3—You can install either a storage battery system alone or a generator and battery system. There are a large number of these now on the market which give very good satisfaction and the installation could be made at a moderate expense.

Wheels Gathered for Easy Steering

Editor THE AUTOMOBILE:—Why are the front wheels of an automobile ¼-in. further apart at the rear of the front wheels than at the front?

2—Would it make very much difference on the wear of a tire should this distance vary 1/16-in. either way?

3—If the front wheels are the same distance apart in front and rear, should the tire wear longer? If not so, state why.

4—Should the tire on a wheel that is not cambered give greater mileage than one on a wheel which is?

New York City. J. M. K.

—The slight gather in the wheels is for the purpose of easier steering and for the purpose of keeping the car in a straight course.

2—It would make a noticeable difference.

3—Yes, although the amount of wear due to the normal gather is not enough to be detected.

4—If by camber you mean inclination in the vertical plane, this makes no difference in mileage.

Plugs Must Withstand Heat and Current

Editor THE AUTOMOBILE:—What are the requirements of a first class spark plug, porcelain or stone?

2—How much heat must the insulation stand and how much current should it take to break down same?

Bridgeport, Conn. A. E. W.

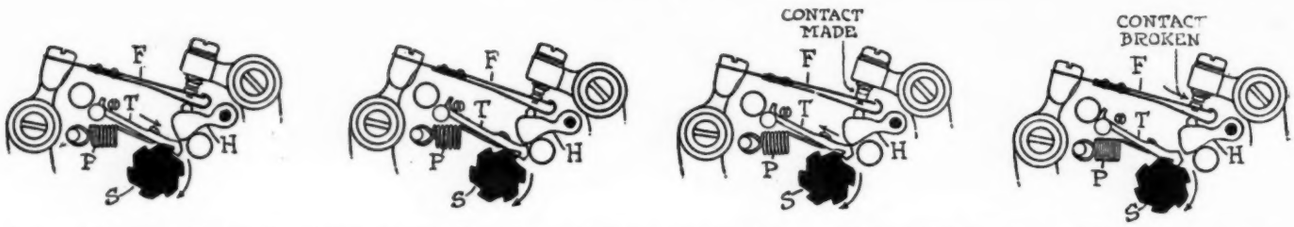


Fig. 1—Diagram showing the phases of operation of the Atwater Kent breaker mechanism and illustrating the open circuit system

—That the insulation does not leak, that the shell is not cracked by tightening the spark plug nut and that the plug does not foul or the points rapidly burn away.

2—The insulation should stand heat up to the temperature of red-hot iron and the dielectric strength must be at least 10 per cent above the possible electric pressure in the high tension system.

Speedster Body on 1915 Franklin Chassis

Editor THE AUTOMOBILE:—Would it be practical to put speedster body on a Franklin chassis 1915 model?

2—Would this outfit operate satisfactorily with a gear ratio of 3 to 1 on high and what speed would this give?

3—Would a Franklin motor be capable of sustaining speeds of 50 m.p.h. or better for any considerable length of time? F. S. W.

Ithaca, N. Y.

—It would be practical to put a speedster body on the 1915 Franklin chassis.

2—The gear ratio of 3 to 1 on high could be used satisfactorily but the speed that the car could make would depend altogether on the condition of the motor.

3—This again is a question of the motor which could no doubt be tuned up to fulfill these requirements.

Operation of the Atwater Kent Timer

Editor THE AUTOMOBILE:—Why is it that the Atwater Kent timer is said to work on the open circuit system; is it because of the way in which the circuit is broken? Kindly explain by diagram.

Philadelphia, Pa. H. R.

—The operation of the Atwater Kent circuit breaker is on the open circuit principle because there is no sustained primary circuit. The contact is made and broken immediately in contra-distinction to the closed circuit in which the contact is remade immediately after breaking.

The operation of the circuit breaker is shown in Fig. 1. The cam wheel *S* has as many notches as there are cylinders and every time one of these notches operates the tripping action an explosion occurs. The notches pull the piece *T* in the direction of rotation of *S*. The piece *T* rides up on the surface of the notch in *S* and finally slips off, being pulled back with a snap by the spring *P*. As it snaps back, the piece *T* strikes the part *H*, which in turn hammers against the spring *F*, making contact for the briefest possible interval. Contact is immediately broken and the circuit is again open.

Piston Displacement per Mile Measures Consumption

Editor THE AUTOMOBILE:—Is it possible to calculate with any degree of accuracy the gas consumption of a car, given the cylinder displacement, geat ratio, and wheel diameter? It seems to me there should be some very definite relation among these factors, yet the results I get from figuring do not tally at all with the actual road tests. What is wrong with my figures?

Thus:

My car, an Oakland, model 50, Northway motor of 346.4 cubic inches displacement, has a gear ratio on direct drive of 4:08 to 1; and 34 x 4½ tires. It is evident that in a mile of 5280 feet, the rear wheels will have to revolve approximately 593.25 times to cover the distance. The gear ratio being 4.08 to 1, the engine turns over approximately 2420 times in the same distance. Each time the engine turns over, one-half of the eight cylinders are fired, from which it appears that its total displacement of gas for this mile is 242.65 cubic feet, or 419,270 cubic inches.

Assuming that the mixture is 1.5 per cent gasoline vapor (the thinnest that can be depended on to explode), this would mean that approximately 3.64 cubic feet of gasoline vapor are required for the mile.

According to Sci. Am. Supp., Dec. 11, 1916, one gallon of gasoline, 70° Baume, gives 25 cubic feet of vapor. If this is true, then the actual miles-per-gallon of this car, figured on a volumetric basis, is less than 7½ miles to the gallon.

As a matter of fact, this car will do 12 miles to the gallon on a fairly level road, in actual practice.

Figuring the same proposition on another basis, that gasoline and air form an explosive mixture at the rate of 1 in 10,000, then 41.927 cubic inches of gasoline would be consumed in one mile. This gives a mileage of approximately 5.5 miles per gallon.

Let us go at the question in still another way: A gasoline engine giving a horsepower-hour on a pint of gasoline is considered an efficient engine. But how does this fit when applied to the case in point? At 2420 r.p.m., according to the above figures, my car travels 60 m.p.h. At 1210 r.p.m., it should travel at 30 m.p.h.

Now, according to the formula $\frac{D^2 N S R}{15{,}000}$ this motor should develop 35 hp. when running at 30 m.p.h. At a pint for each hp. hour, this would mean 35 pints of gasoline, or 4⅜ gallons, which gives us a mileage of 6.85 miles to the gallon. Again we are away off from road results.

The factors in the first example seem to be fixed, positively; the engine must turn over 4:08 times to each revolution of the rear wheels; and the engine must consume 173.2 cubic inches of gas at each revolution. So it seems. Yet only recently we were told that a Cadillac showed approximately 20 miles per gallon at 15 miles per hour, and only 6 or 7 miles per gallon at 60 miles per hour. Does the gas become richer at high speed? Carburetor engineers tell us they strike to make it thinner. Skin friction and inertia are at the maximum at high speeds. Then why is not volumetric efficiency higher with high speeds? Apparently, from the Cadillac and other tests, it is lower—practically varies in inverse proportion with miles-per-hour.

If this question is sound, I should like to see it discussed in THE AUTOMOBILE by some of your experts. If it is not sound, throw it away. I am one of a large body of your readers who, as automobile owners, without technical education, find in your magazine the final spice necessary to make perfect the joy of owning and operating and keeping their cars in good condition. Therefore, please tell me why my car is more efficient on the road than it is on paper.

New York City. A. I. A.

—In your first test where you have calculated the amount

of gasoline drawn into the cylinder in a mile, there are two important factors which you have neglected. First, the amount of air used is far in excess of the theoretical combustion limit and if only the theoretical amount of air were admitted to the cylinder the mixture would be too rich for practical purposes. As all the oxygen in the air is not combined with the fuel in combustion, it has been found necessary to supply a considerable excess of oxygen in order that best results be obtained.

The second point you have omitted in your calculation is the volumetric efficiency of the motor. If this efficiency coefficient is 0.85 or 0.9 it is quite evident that you will get much less actual displacement per mile than you do theoretical.

On your second test you have calculated on a full throttle opening which is not the case always at 30 m.p.h. and certainly not with your car, if it is capable of traveling 30 m.p.h. Normally the amount of gas passed by the engine is between 0.3 and 0.7 the calculated total. The pressure of the atmosphere is insufficient to charge the cylinders fully during the short time the intake valve is open and also the exhaust gas left in the cylinder is a little above atmospheric pressure, so delaying the commencement of intake.

Non-Poppet T-Head Motor

Editor THE AUTOMOBILE:—Is it possible to have a motor of T-head cylinder shape without poppet valves? In order to do this it would be necessary to have sleeve valves on each side of the cylinder and I would like to know if this has ever been done.

New York City. C. G. S.

—The double-rotary valve shown in Fig. 2, is a good example of T-head motor without the poppet valves.

Timing of Model 19 Buick of 1910

Editor THE AUTOMOBILE:—Will you kindly give me a diagram showing the timing of a model 19 Buick? I think this car was built in 1910. F. D.

Warwick, N. Y.

—Model 19 Buick is properly timed when the piston is 1/16-in. past upper dead center and the inlet valve opens when the piston is 3/32-in. past upper dead center. These measurements should be taken with a clearance of 0.005 in. between the ends of the valve stems and rocker arms when both valves are fully closed.

These measurements are taken by removing one of the valve cages and measuring the piston travel in the cylinder with an ordinary scale.

Enger 6-50 Used Salisbury Axle

Editor THE AUTOMOBILE:—What make of rear axle did the Enger model 6-50 use in the 1915 cars?

2—What make clutch?

3—What transmission did they use in the 1912 Enger cars? J. F.

Wilkes-Barre, Pa.

—The Salisbury rear axle was used.

2—Mechanics Machine Co., multiple disk dry plate type.

3—Milwaukee unit power plant.

Velocity Depends on Motor Speed and Ratio

Editor THE AUTOMOBILE:—How can a machine with 4 sq. ft. of head resistance travel faster than one with 6 sq. ft. if the motor speeds are the same, as are also the weight of the machines, horsepower, gear ratios and size of wheels?

2—If the maximum speed of a motor is 4200 r.p.m. with gear ratios and horsepower the same in both instances, would reducing the head resistance increase the speed of the car? L. H. A.

Battle Creek, Mich.

—If the motor speeds are both *the same* and the gear ratios and size of wheels are both *the same* both machines must travel at the same speed regardless of *any* other factors.

2—If *the same* maximum motor speed is obtained the gear ratios being constant, the speeds must be equal, but neither the same maximum car speed nor the same *motor* speed would be obtained in two cars with different head resistance but otherwise identical.

Wear Varies with Pressure and Speed

Editor THE AUTOMOBILE:—Is the wear on a bearing in proportion to the square of the pressure?

2—Is the wear in proportion to the speed?

3—The Diesel engine seems to be an ideal engine judging from what I have read of it. Why are they not used in automobiles?

4—What are the objections to kerosene?

Jersey City, N. J. O. T.

—No, inversely as the square of the diameter.

2—Yes.

3—The satisfactory automobile unit has not been as yet evolved although there are many engineers who believe that the Diesel principle will be incorporated in the eventual automobile power plant.

4—It cannot be handled satisfactorily with the present methods of vaporization as employed in automobile practice. There is no doubt that the kerosene motor is not nearly so far off as its present absence would seem to indicate.

Car Should Travel 350 Miles to Gallon of Oil

Editor THE AUTOMOBILE:—Will you kindly answer the following questions on Studebaker Six, 1914?

1—How many miles should this car get on a gallon of gasoline with a lean mixture?

2—How many miles will this car get on a gallon of lubricating oil?

3—How can I lower the rake of the steering wheel and column, also the front seat, as I would like to sit about 3 or 5 in. lower. F. M.

Philadelphia, Pa.

—You should average in the neighborhood of 10 miles per gallon.

2—The Studebaker Corp. states that owners should get about 350 miles per gallon of oil.

3—It is suggested that you have a thinner front seat cushion made and an extension bracket for the steering post.

Motor Misses at Low Speeds

Editor THE AUTOMOBILE:—I have a 1914 Baby Grand Chevrolet. It misses at low speed whether running idle or pulling the car. The miss is approximately one shot out of

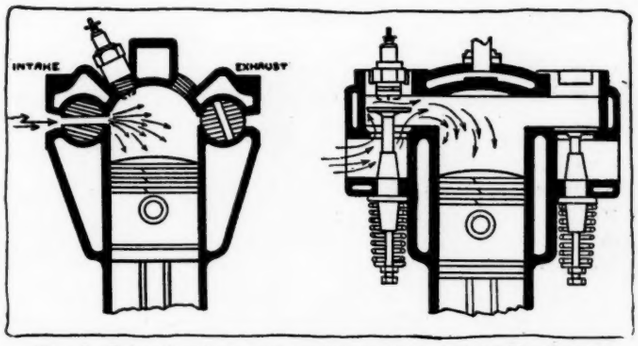


Fig. 2—T-head rotary and poppet motors, left is Mead type

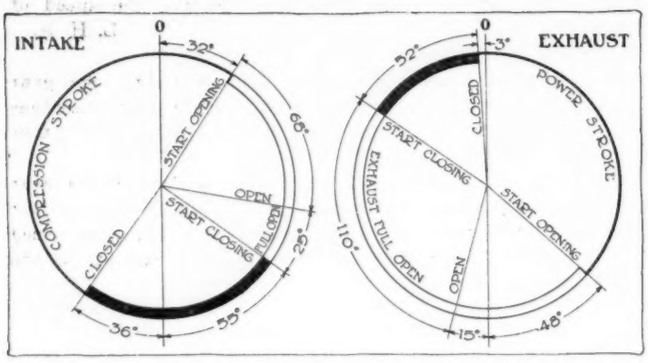


Fig. 3—Timing diagram showing intake opening delayed after exhaust closure

four. Sometimes two miss together, and there is nothing regular about it. After the car is running 20 m.p.h. and faster it runs perfectly and for all speeds higher. This has been acting so for nearly a year. It never refuses to go and starts very easily. I have installed a Schebler carbureter but to no great advantage. I have had it in shops all over central California, San Francisco included. F. H. E.

Woodbridge, Cal.

—It would seem that the ignition system was deranged in some way as to cause a momentary interruption in firing at scattered intervals and it is advised that this be overhauled. Eliminate spark plug considerations by trying a new set of plugs. Then borrow a new timer from another Chevrolet and try this. The same process may be used with each of the ignition units. Sometimes a loose part in a switch will cause uneven firing due to momentary interruption of the current. Faulty insulation or terminal connections give the same indications. Do all the valves close properly? If one should stick or hang up a few thousandths of an inch it would cause the trouble.

Late Intake Creates Vacuum in Cylinder

Editor THE AUTOMOBILE:—Why do some of the manufacturers leave the intake closed for some time after the exhaust valve is closed? Do they not cut down on volumetric efficiency by so doing?

Ilion, N. Y. M. S.

—The reason for the delayed opening of the intake is to create a vacuum in the cylinder which will cause the inlet gases to rush in and fill the cylinder. It takes a noticeable amount of suction to overcome the inertia of the gases and this vacuum is left for the purpose of overcoming this inertia. A diagram showing a late intake opening is illustrated in Fig. 3.

Offset Crankshaft Not Used Extensively

Editor THE AUTOMOBILE:—Has the offset crankshaft been discarded from four and six-cylinder engine design in the auto world?

2—Did not this feature tend to make a more compact motor and also to even up the pressure on the cylinder walls due to a greater connecting rod angularity on the up stroke and less angularity on the down stroke?

3—How does the Cothias process differ from conventional die casting practice?

4—Is the speed in r.p.m. used to designate a high speed motor its maximum speed or the speed at which maximum power is delivered? H. S.

Ann Arbor, Mich.

—Practically entirely, although there are a few still in use.

2—In practice this feature did not seem to give any noticeable advantages.

3—By the use of secret details which allow the use of aluminum, which contracts on cooling, instead of a babbitt, which expands.

4—Generally.

Mixed Fuels Are Generally Undesirable

Editor THE AUTOMOBILE:—Would it be feasible to mix kerosene with gasoline to use in a gasoline motor car providing the fuel is heated and a small jet of steam was let into the intake manifold? If so, about what proportion of gasoline and kerosene? H. C.

Riverton, N. J.

—It is better not to use a mixed fuel but rather one of lower gravity which would give the corresponding fuel. The jet of steam would hardly produce the desired results in automobile practice.

Parents Responsible for Minor's Action in Car

Editor THE AUTOMOBILE:—Please inform me if the owner of a car can collect damages if his car is run into while being driven by his son, who is not quite sixteen years of age, with his father's permission. The car was on the right side of the road when hit and was less than 4 ft. from curb. Road was 24 ft. wide. W. T. L. TB.

Newburgh, N. Y.

—While this is a matter for the courts to decide, it seems right that the father can collect damages. Not long ago, a father was compelled to pay damages for an accident which occurred while his son was driving the car without the father's permission. It seems reasonable that the law should work both ways.

Tire Sizes Used by Studebaker

Editor THE AUTOMOBILE:—Can you tell me the different size tires the different Studebaker cars take, from the first model up to the present ones? Also, the number of cars made by this corporation under the name of Studebaker from the first up to the present time or for the close of the year 1916, etc.? W. M. S.

Detroit, Mich.

—The table herewith gives you the size of tires used by the different model Studebakers from 1907 until the present date. It is impossible to state the annual output of the Studebaker company for all these years.

1907

Model	Tires
40 hp	34 x 4
35 hp	34 x 4
15 hp	34 x 4 and 4½
30 Elec	30 x 3

1908

No Information

1909

Model	Tires
A 27 hp	36 x 4
B 36 hp	34 x 4½
D 36 hp	36 x 4½
D 36 hp	36 x 4½
B 36 hp	34 x 4½

1910

Garford Model or G-7

Front	Rear
36 x 4	36 x 4½

1911

Model	Front	Rear
G 8 36.1	36 x 4	36 x 4½
G 8 36.1	36 x 4	36 x 4½
G 10 28.9	36 x 4	36 x 4
A 25.6	34 x 3	34 x 3½
B 36.1	34 x 3½	36 x 3
C 36.1	34 x 4	36 x 3½

1912

Went under name of Garford

1913

Model	Front	Rear
20 20.30	32 x 3	32 x 3
25 19.60	30 x 3½	30 x 3½
30 25.60	32 x 3½	32 x 3½
35 27.25	34 x 4	34 x 4
Six 29.40	34 x 4	34 x 4

1914

Four 19.60	32 x 3½	32 x 3½
Six 29.40	34 x 4	34 x 4

1915

Model	Tires
4-SD 19.61	33 x 4
4-SD 19.61	33 x 4
6 29.45	34 x 4
6 29.45	34 x 4

Which Front Tire Wears First

Editor THE AUTOMOBILE:—Which will wear the longest, the right or left front tire under ordinary conditions?

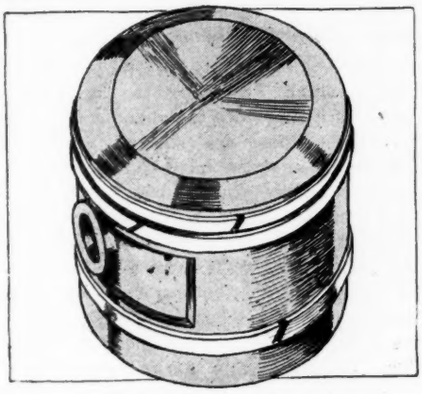
Osco, Ill. C. L. M.

—There will be very little difference in the wear of the two front tires. The fact that the driver usually sits on the left side and frequently is the only extra weight in the car would tend to cause slightly more wear on the left tire. On the other hand, the fact that most of the turns are made to the left, when turning around, would cause the right tire to travel the greatest distance, and, on this basis, it would wear more quickly. Taken all in all, the wear is about equal, in ordinary cases.

ACCESSORIES

Abcilium Alloy Pistons

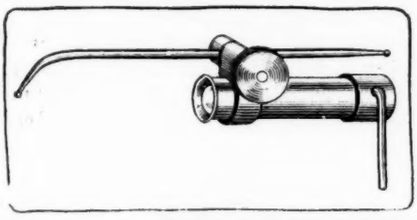
BY the use of the metal abcilium, pistons are obtained which are claimed by the manufacturer to be 70 per cent lighter than cast-iron pistons of the same size. A manufacturing feature of advantage is that the use of expensive dies is said to be unnecessary, the makers recommending sand-cast abcilium pistons, stating that their density is so great that each will withstand an hydraulic pressure of 80 to 100 lb. from within. This feature also eliminates the expense entailed by changing patterns, etc. Abcilium pistons are said to absorb oil under pressure, this oil oozing out again when the pressure is relieved. The maker declares that abcilium pistons have run for from 60,000 to 70,000 miles without showing signs of wear. Other advantages claimed for these pistons are: increased power, acceleration and speed with a corresponding decrease in fuel and upkeep expense; decrease of strain on crankshaft and connecting-rod bearings and bolts; reduction of carbon incrustation; and durability to the extent that none of the parts wear out of shape under severe service and extreme heat.—A. B. C. Castings Co., Cleveland, Ohio.



Abcilium aluminum alloy piston

Kander Test Indicator

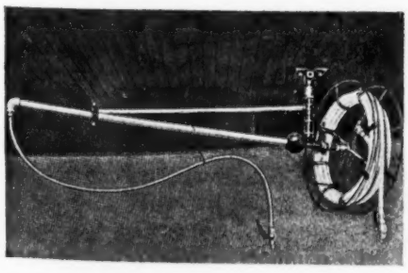
A pointer adjustably clamped on a metal tube containing a flash-light battery and a small bulb comprise this device. The instrument is so mounted, when in use, that the needle can be brought close to the surface of work running in the lathe or other machine tool. If there are high spots the pointer will touch them and thereby ground the lamp, which will flash and indicate the high spot. It sells for $2.50.—J. G. Kander, Reading, Pa.



Kander flashlight test indicator for machine work on lathes, etc.

Gaylord Combination Washers

This consists of a swivel washer, at one end of which is a hose reel carrying from 50 to 100 ft. of hose, which is connected with the water supply, and at the other end, a 10-ft. hose with an automatic spring valve at the nozzle. The water is turned on in the hose on the reel by pulling the hose. By the use of the two outlets, two men can work on a job at the same time; or the reeled hose may be kept for fire purposes, for which it is especially suitable because of the ease with which the water is turned on. A plain revolving washer is also made without the reel and automatic attachment at prices ranging from $12 to $30. Both types may be had with or without electric lights. Prices $25 to $50. —Gaylord Sanitary Mfg. Co., Rochester, N. Y.



Gaylord combination washer

Affinity Cleaner

No water is required in using this compound which is said to effectually clean oil and grease from the clothing and hands. It has a pleasant odor and is not injurious in any way according to the manufacturer.—Affinity Cleaner Co., Omaha, Neb.

Apco Fender Brace for Fords

The Apco fender brace, besides preventing the fenders of a Ford car from rattling, is designed to seal the space between them and the aprons. The brace is a heavy strip of pressed steel which fits well, being held in place by special screws which are easily attached. Besides increasing the rigidity of the fender, the brace prevents water, mud, etc., reaching the running-boards. Four of the braces comprise a set, including the screws, the finish being baked-on black enamel. The braces list at 50 cents.

The new Apco emergency brake handle for Fords is claimed to be an improvement over the ordinary handle in being more positive in action, fitting the hand, and in appearance. Complete with attachments and ready for fitting, it sells for 60 cents.—Auto Parts Co., Providence, R. I.

Pee-Gee Paint for Fords

The outfit consists of 1 qt. of flat black, 1 qt. of top black, 1 pt. of top dressing, coarse and fine sandpaper and a 2-in. brush. It sells for $3.—Peaslee-Gaulbert Co., Louisville, Ky.

Hansen Air Chucks

The Service chuck provides an automatic connection between air hose and valve stem and is fitted with a mushroom valve which is opened by the valve stem and which closes as soon as the chuck is removed from it. It lists at $3.

The Hansen hose connection is designed for smaller garages and use on portable tanks. It grips the valve stem by a soft rubber sleeve which prevents leakage. Price, 80 cents. The same connection may be had with a pressure gage and by pressing down on the gage the exact pressure in the tire may be read. Price, $2.—Hansen Mfg. Co., Cleveland, Ohio.

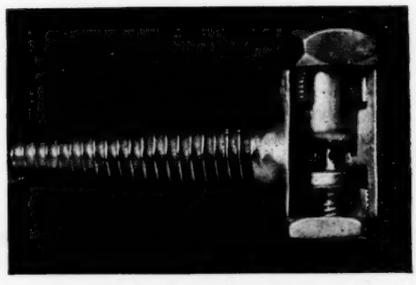
Lewis Nojar Clock

This clock is contained in a rubber case which protects it against road stocks and car vibration. Stem wound and guaranteed for two years, it is made for all makes of cars, the Ford model being attached to the steering wheel and selling for $2.50, while the others are put on the dash and sell for $3 each.—Pennsylvania Rubber Co., Jeannette, Pa.

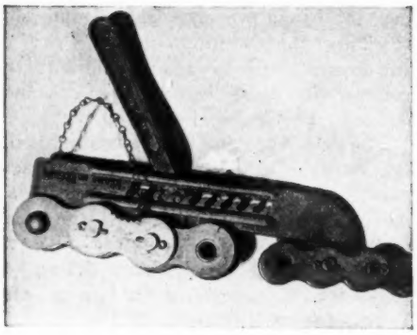
B-G Spark Plug

A spark plug that is unusual not only in outward appearance but in its internal construction is the B-G Non-shortable, recently placed on the market.

Two factors give the plug its outward novelty; it is copper plated for protection and to permit easy unscrewing when tightly set up and the wrench faces are



Hansen Service automatic air chuck



Meyer tool for repairing broken motor truck drive chains

carried high to give the wrench a chance when the plug is inserted in a deep recess.

As for the interior, the central electrode is not an ordinary metal rod, but is composed partly of a carbon compound packed into a recess in the porcelain. The manufacturers claim that this has the effect of greatly enlarging the spark and of so affecting its character that it will not short-circuit through a carbon deposit on the insulation. The porcelain is inclosed in a double bushing designed to overcome breakage at the shoulder. The plug is assembled with the main bushing and porcelain in place and melted metal is poured between the bushing and the porcelain, making a close fit and a firm support for the porcelain. The exposed part of the porcelain is corrugated to increase the surface area. Plugs are packed in a metal can with a ferrule to protect the points which, by the way, are of the highest grade meteor wire. All standard sizes, $1.50 each.—Batcheldder-Gallant Co., Boston, Mass.

Queen City Portable Garages

These garages are built of wood in sections and are put together with bolts, a wrench being the only tool required. Studding and rafters are of hemlock, siding of yellow pine and roofing of rubber; trim is white pine, doors glazed and paint may be of any color without extra charge. No floors are included. Price, 10 by 16 ft., $65; 18 by 16, with double door, $120.—Manufacturers Outlet Co., Buffalo, N. Y.

Meyer Chain Connector

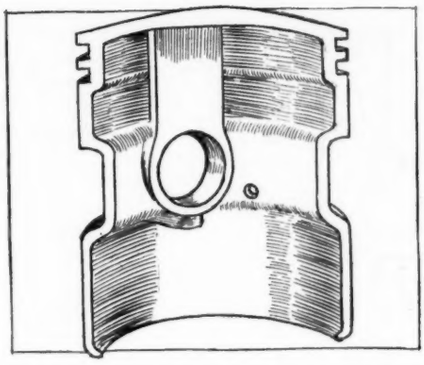
It is always a great deal of trouble to bring the ends of a broken motor truck driving chain together, and it is practically impossible to draw the two ends together by hand in order to slip in the link pin. This prompted the invention of the Meyer chain connecting tool illustrated herewith in the act of drawing the ends of a broken chain together. The head of the tool terminates in a hook that is placed behind the first link and there is also a hook on the end of the lever, this catching the other end of the chain. Thus the slack in the chain is drawn up by the lever being moved forward from notch to notch in the main part of the tool, this working on the dog-and-ratchet principle. When the two parts of the chain are brought together, it is an easy matter to slip the pin in place. The device is made for small trucks at $2 and for large trucks at $3. —H. T. C. Meyer, Detroit, Mich.

Green Aluminite Pistons

These pistons are of an aluminum alloy, which, according to the makers, permits fitting with a clearance of 0.0014 per in. of diameter without danger of scoring even under hard conditions. The metal machines freely, has no pin holes and becomes glazed on the surface with a skin which is said to be better than that of cast iron. A feature is the use of stiffening ribs extending from the head to the piston pin bosses, having no connection, however, with the side walls. The effect of this arrangement is to minimize distortion through expansion.—Green Engineering Co., Dayton, Ohio.

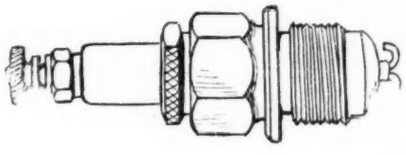
Niswander Rim Remover

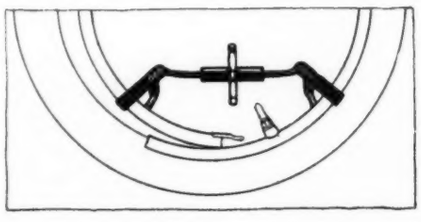
This tool for removing demountable rims easily and rapidly contracts and expands the rim by a specially-threaded hand wheel. This gives an even, steady pull, contracting the rim from 1 to 4 in., and the rim hooks and braces are so constructed that the harder the pull, the tighter they grip the rim in either operation. The device folds to a length of 10 in., and although strongly made, it weighs but 2½ lb. and can be easily carried in the coat pocket. The rim hooks are of carbon steel and have sufficient spring to adjust themselves to rims of any width. Nickel-plating and high polish prevent the accumulation of rust. The maker guarantees the tool to work successfully on rims of any size or make. It sells for $3.—Niswander Mfg. Co., Quincy, Ill.



Green Aluminite piston construction

A Queen City portable garage





Above—3-X spark plug. Below—Niswander rim remover

3-X Spark Plugs

The 3-X is a heavy plug with steel shell and packing nut and blue porcelain insulation, the central electrode being split and turned back, forming two sparking points from which the current jumps to the surface at the end of the shell. The opening into the chamber back of the points is a small slot. The terminal at the top is of heavy brass and will take either spring clips or plain terminal tips. All regular and special sizes are made, selling for $1 each.—3-X Spark Plug Co., Chicago, Ill.

Giles Tire Valve

This is a tire valve which will perform all the functions of that part and will also take the place of a pressure gage. The Giles valve shows through a slot in its stem figures indicating the air pressure in the tire.

The valve itself is of the conventional type. The stem, however, is smaller in diameter than usual. A flat, thin-walled tube is coiled about it, the lower end of which is anchored while the upper end is left free with a dial attached.

The upper end of the tube is closed and the lower end communicates with the interior of the valve, thus being under the same pressure as the tire itself. The operation of the gage is the same as that of a steam gage, the pressure tends to uncoil the tube, and the dial is turned according to the pressure. The reading slot is placed at the top in the outer stem. Price, $1.25.—E. M. Giles, Peoria, Ill.

The Automobile

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Laying the Foundation

BUILDING an industry, like building a nation, consists in rearing the structure of progress upon the foundations laid by the pioneers. It is to these pioneers and to their early experiments and environment that the heirs to the results of their work must turn from time to time to express gratitude for benefits received. Great sacrifices have always been made in foundation work.

Citizens of the United States have set apart certain days dedicated to those who have by their personal sacrifices, potential personalities and genius furthered the interests of their country. Every school boy is familiar with the names of the thirteen colonies that founded the great union which now spans the continent. Certain men and certain environments are beacon lights in the history of development and it is fitting to render expressions of recognition and gratitude to those patriots and to the scenes of their great activities.

Hardly second in importance to the building of a nation is the building of a gigantic industry which is of benefit to the entire world, constituting a very arc light illuminating the onward path of civilization. Just as the nation has its great founders who with wonderful foresight and determination lay down the lines of progress for the future, so has the industry its great pioneers who often made a life-long sacrifice to attain some little detail of advancement which has proved the key which has opened the gates to triumph in progress. Just as the nation has its hallowed ground upon which great deeds of war or peace were enacted, so has the industry its cherished localities where perhaps the cornerstones of great eras in development were laid.

To-day we turn to New England. Its history is the history of the country. New England, the scene of witchcraft and the whipping post, has had its darker days, but the accomplishments which have originated in that fair country and which are now reflected in its wealth and prosperity, in its wonderful manufacturing activity, are the rewards for the endeavors of the pioneers who have blazed the trail.

Cut the Gas Bill

EVERY experienced automobile man knows that, if they will take the trouble, users of cars can save a large proportion of their gasoline by taking proper precautions. At the present time, with gasoline at almost famine prices, it seems highly desirable that the subject of economy should be brought very forcibly before the user. The user of an automobile is in constant touch with dealers and garagemen, and in fairly close touch with the factories through their sales and service departments. This being the case, there is a great opportunity for the industry to educate the user so that he can reduce the fuel bill for his car.

There is no need to go into the matter in detail. A little skill allows the use of a far leaner mixture than is employed by the average man in ordinary running; keeping the valves, the ignition and the lubrication in proper order makes for efficiency and so saves power waste; care in one way or another is rewarded by the need for less gasoline to do a given mileage.

This is the most vital matter the industry has before it to-day. Never before have the men who act as "guide, philosopher and friend" to the user had to give close study to this economy question, but if they do not strongly buckle to just now, they will be failing in their duty and failing to grasp an opportunity for action which will react upon their own fortunes by giving the industry some very real assistance.

Every salesman and every dealer to-day ought to do all in his power to become an expert on the subject of saving gasoline, so that he can quickly, and accurately, furnish advice when it is sought. The day when the prospect's first question will be "how many miles to the gallon?" is not far distant, and the trade should, nay *must*, be prepared to give an answer that can be substantiated.

Nor should the automobile industry be content to let the matter rest there. Car manufacturers and engineers should redouble their efforts to reduce in every way possible to constructive and designing science the gasoline consumption of their cars. Everyone should realize that the matter is one which vitally concerns the continued success of the industry.

1915—Big Year for New England

Car, Truck and Accessory Factories in This Territory Break All Records

BOSTON, March 1—Taking inventory of the activity of the New England automobile, trucks, parts and accessory factories during the past year, the great increase in the industry and the unprecedented activity of the factories stand out conspicuously. All factories have been busy, and many parts manufacturers have operated on a 24-hr. schedule. Fully 100 per cent of New England manufacturers have increased production from 100 to 500 per cent, and 90 per cent of them have increased the factory facilities. In the vehicle field, Locomobile has had a particularly busy year with its truck work, and its car output has increased. Metz has added 160,000 sq. ft. to its factory at a cost of $300,000. Knox has expended a great deal of effort on its four-wheel tractor business. Stanley has increased its production.

Parts Field Active

In the parts and accessory field equal activity is found. The Connecticut Telephone & Electric Co. has added 40,000 sq. ft. manufacturing space at an expense of $50,000 and has added $25,000 equipment. The Pittsfield Spark Coil Co., formerly located at Dalton, is now located at Pittsfield with increased manufacturing facilities.

The New Departure Mfg. Co. has added a new building during the year and has others in process of erection. Fafnir Bearing Co. has doubled its manufacturing space.

The Waltham Watch Co. has made very great increases in its sale of clocks to the automobile trade.

Bausch Machine Tool Co. is adding a new building for the manufacture of worm drive units. The Heald Machine Co. has added a new building 300 ft. long for its grinding machines. Large increases in factory capacity have been made by the North Grinding Co. The Berkshire Magneto Co., a new organization, is practically ready to market its magneto.

The S. K. F. Ball Bearing Co. is building a new factory in Hartford. Rockwell-Drake Co. is erecting a new ball bearing factory at Plainville, Conn.

The Hartford Auto Parts Co. is erecting a new plant at New Britain. Additions have been made to the plant of the Royal Equipment Co. during the past year.

A new factory has been built during the year by the American Chain Co., in Bridgeport.

The Fisk Rubber Co. has been expanding manufacturing facilities by the erection of new buildings during the entire year.

The Bosch Magneto Co. has increased its manufacturing facilities by 60,000 sq. ft., the new building serving as an annex to the old factory.

The Auto Parts Co., Providence, has erected a complete new factory during the past year. The Mayo Radiator Co. has greatly increased production during the past year. The G & O Mfg. Co. started a new radiator business in New Haven a few months ago. Increased production has been made by the J & B Mfg. Co., Pittsfield, Mass., and also L. S. Starret, manufacturer of fine tools, Athol, Mass.

The Springfield Metal Body Co. has entirely reorganized with greatly increased capital, and is adding to its manufacturing facilities, to take care of factory business.

The Chelsea Clock Co. and the Boston Clock Co. have increased output and production facilities during the year.

Billings & Spencer, during the year, disposed of their old plant in Hartford and have occupied the factory of the Columbia Motor Co. and have added two new buildings.

Whitney Mfg. Co. has added an addition. Wyman & Gordon Co. has added to its forging facilities.

Norwalk Tire Co. has started during the year at Norwalk, Conn.

During the year the Boston Blacking Co., one of the largest manufacturers of shoe blacking, has entered the automobile field with a full line of automobile polishes, top dressings, etc.

The G. W. J. Murphy Co., Merrimac, Mass., maker of the Murphy curtain fastener, has secured a new plant at Amesbury, Mass., for immediate occupation, with ten-fold its present facilities.

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L. P. C. Service Sold

RACINE, WIS., Feb. 28—The American Motors Co., Indianapolis, Ind., bid in the service and good will of the L. P. C. Motor Co., Racine, Wis., at the auction sale of the Racine company's assets ordered by the assignee, F. Lee Norton. It was the first parcel offered for sale and brought $3,400. The American Motors Co. will act as service house for all owners of L. P. C. cars in the future and will be in exclusive possession of repair parts.

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Warner Gear Not in Merger

MUNCIE, IND., Feb. 25—R. P. Johnson, general manager of the Warner Gear Co., this city, states that the Warner Gear Co. is in no way concerned in the merger which was reported to be undergoing formation among Indiana concerns.

Dealer Wins in Horn Patent Suit

Court of Appeals Reverses Decision of Lower Tribunal in Klaxon vs. Oriental

NEW YORK CITY, Feb. 29—By a decree filed to-day in the U. S. circuit court of appeals for the second circuit, the decision of Judge Chatfield in favor of the Lovell-McConnell Mfg. Co. in its suit against the Oriental Rubber & Supply Co., has been reversed. Judge Chatfield's opinion, handed down last July in the U. S. district court for the southern district of New York, held the Hutchinson patent No. 1,120,057 valid and infringed by electric horns sold by the Oriental concern.

The patent in suit covers a construction having the drive shaft forming the axis of the electric motor at right angles to the plane of the diaphragm and slightly below the center. A face cam is used to vibrate the button at the center of the diaphragm.

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Materials Market Unchanged

DETROIT, MICH., Feb. 28—Manufacturers of this city who were interviewed to-day see very little change in the condition of the general materials markets as compared with their status two weeks ago, when a general investigation was made. Most of them express the view that no relief from the current high prices of all raw materials is in sight. The recent German successes and talk of an early ending of the war should Verdun fall into the hands of the Kaiser's troops would not mean any bettering of prices for some months at least, until the producers could get reasonably caught up in their orders. However, such an outcome seems so remote that few if any of the Detroit automobile industry are taking such a long chance and are contracting now for deliveries well into 1917 at current prices. The feeling is quite general that the steel mills are taking as good care of the industry as could be expected under the existing circumstances.

In conversation with one of the largest carbureter makers, this manufacturer said that there seems to be even greater trouble in getting brass, which has heretofore been a necessity to carbureter production. However, his concern will soon be making nothing but malleable instruments, so the brass shortage will not effect him very much. This is a very interesting development of the material situation and indicates that the manufacturers are meeting conditions as they find them. There is no reason

why malleable iron could not be used advantageously, but it took unprecedented conditions to force its development.

Wm. T. Jones, general manager of the Edmunds & Jones Mfg. Co., large maker of automobile lamps, whose principal requirements are brass, steel and glass, is one of those who does not see any immediate relief, although his company is in an enviable position due to having contracted as long as eighteen months ago for what materials would be needed this year. He states that the concern now has in stock five times as much material as one year ago, this serving to indicate the foresight displayed in many of the big factories. As a result, current high prices are not felt, but as there does not seem to be any tendency to lower prices, Mr. Jones said that they are now contracting for supplies for delivery during the second quarter of 1917. In normal times it would not be necessary to figure more than sixty days ahead, he explained, but now it is necessary to look twelve months ahead on steel. The conditions are not quite so bad for brass deliveries, however. It is easier to get glass than many other products, according to Mr. Jones.

Everything Going Up

Others of the big parts makers here, as well as the car manufacturers, see no great change, and, as J. E. Ryan, purchasing agent of the Russel Motor Axle Co., put it, everything seems to be on the up grade. He looks for no big drop for some time, at any rate not until the mills get reasonably caught up in their orders. It is next to impossible to contract for brass and copper, because it would not be advisable with the market so high and somewhat subject to fluctuations.

F. C. Gilbert, sales manager of the Timken-Detroit Axle Co., also stated that the steel market is higher and wilder.

It looks as if conditions would become even more strained than they have been, and while the Timken company is protected on steel and has been able to protect its customers, the steel mills are not able to give prices after next July delivery. The mills, he said, will protect on tonnage, but they are unable to say what the price will be.

The fact was also emphasized that car makers, dealers and the general public must fully meet the conditions and realize that prices for motor vehicles must go up, if quality is to be maintained. There is very evidently no way out of it. It is surprising how unanimous well-informed automobile men here are on this point.

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Dividends Declared

Packard Motor Car Co.; quarterly of 1¾ per cent on preferred, payable March 15 to stock of record Feb. 29.

Kardo Axle Suit Re-Opened

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Ohio Court of Appeals Upholds Corporation's Validity and Orders Rehearing

CLEVELAND, OHIO, Feb. 29—The decision of Judge J. H. Clarke of the United States district court of Ohio in dismissing on April 13, 1915, the patent infringement suit brought by the Kardo Co. against Henry J. Adams, dealing as the Reo Motor Sales Co., this city, has been reversed by Judge Hollister, sitting in the Federal court of appeals. Judge Hollister held that the Kardo Co. is a good corporation under the laws of Ohio and therefore has a right to bring suit for alleged patent infringement. He remanded the case to the lower court for rehearing of the patent claims.

This decision practically re-opens the case which has been in the courts now for over a year, and the higher court instructs that the lower court confine its decision to the merits of the patent in question. The Kardo Co. brought suit against Adams on Jan. 29, 1915, substituting for the American Ball Bearing Co., and charging infringement of patent No. 792,690 issued to Alanson P. Brush of Detroit by the use of a compensating mechanism termed a floating spider in the bevel gear of the rear axle of Reo cars. The Kardo Co. fell heir to the suit against the Reo representative when it took over the patents of the American Ball Bearing Co. The bill of complaint was filed June 25, 1913, and the case was transferred to Kardo on Oct. 3, 1914.

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De Palma Becomes a Manufacturer

DETROIT, MICH., Feb. 28—Ralph De Palma is one of the incorporators of the De Palma Mfg. Co., which has been organized here with a capital stock of $100,000. The others interested with the famous race driver are Frank P. Book and J. B. Book, Jr., wealthy Detroiters. While the incorporation papers state that the new company will build aeroplane engines as well as racing cars, the main purpose at the present time is to campaign De Palma's Mercedes which gave such a good account of itself last year. The De Palma company will enter the Mercedes in the big race meets of the year, according to present plans, and Ralph is now busily rebuilding it at the present time here.

The officers of the De Palma company are: F. P. Book, president; Ralph De Palma, vice-president and general manager, and H. V. Book.

Although H. V. Book does not appear in the incorporation papers, he will be the secretary and treasurer when he becomes of legal age two months hence. J. B. Book, Jr., owing to the fact that his brother is not yet of legal age is therefore the third incorporator, although he will have no active interest in the company. All the stock of the concern is subscribed for, and there is none for sale, the incorporators wishing this to be made clear in view of the fact that they have already been approached by parties wishing to become interested.

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Scripps-Booth Reorganized—Incorporated with $1,000,000 Capital

DETROIT, MICH., Feb. 28—A reorganization of the Scripps-Booth Co. has been effected, the company having increased its capital stock to $1,000,000 and incorporated under the laws of Delaware.

Clarence H. Booth, who became associated with the concern last December and who has been vice-president and sales director, has been made president; William E. Scripps, vice-president; James S. Booth, secretary, and F. J. Sensenbrenner, treasurer.

Of the new capital stock $750,000 has been subscribed and paid in while the balance of $250,000 is being held in the treasury for future needs.

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Need for Testing Argued by Metro. Section S. A. E.

NEW YORK CITY, Feb. 25—At the regular February meeting of the Metropolitan Section, Society of Automobile Engineers, held at the Automobile Club of America last night, Leonard Kebler, president the Ward Leonard Electric Co., was elected chairman; Harry Tipper, advertising manager, Texas Co., secretary, and H. G. McComb, engineer the General Vehicle Co., treasurer.

The program for the evening included a symposium on motor testing and was provocative of a valuable discussion on the real needs of testing commercially. The topic was introduced by Peter Payne Dean, former engineer of the Diehl Mfg. Co., who took the viewpoint that it is not necessary to secure horsepower readings at the rear wheels.

This viewpoint was discussed by C. F. Scott, engineer of the Sprague Electric Wks. and others. The net result of the discussion seemed to be that some form of testing is necessary, but there was evidently a disagreement among the members present as to whether or not the expense of the dynamometer equipment is justified.

In bringing forward his arguments Mr. Dean stated that in his opinion the blower system fits the situation best of all, assuming of course that the accurate horsepower at the rear wheels is not to be measured accurately. The movement of the air in absorbing power does not create heat and furthermore the

installation is not expensive. The air can be used to cool the radiator and thus simulate the actual conditions of running the car. In a modern installation, a series of multivane or paddle-wheel blowers are installed either in the test room ceiling or underneath the floor. They can be either driven through friction drums or by belt. This installation is now in use at the Chevrolet plant.

Mr. Dean stated that on comparing costs he finds that the electric dynamometer system to absorb 25 hp. would cost $800 per set, while the blower system for the same power output could be installed for $300 per set.

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Knobloch Becomes Cole Motor Car Co. General Manager

INDIANAPOLIS, IND., Feb. 25—A. F. Knobloch has become general manager of the Cole Motor Car Co., this city. Mr. Knobloch was formerly general manager of the Northway Motor & Mfg. Co. He has also brought into the Cole company his brother. W. H. Knobloch, and A. Keller, an efficiency engineer.

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Elgin Contest Board Chosen

Chicago, Feb. 28.—W. O. Duntley, recently elected president of the Chicago Automobile Club, has appointed the following members to serve on the contest board, which will direct the promotion of the Elgin road races, the Chicago speedway events and the annual interclub reliability matches during 1916:

George Ballou, chairman; Joseph Callendar, Tom Hay, A. M. Robbins and E. C. Patterson. This committee will have as its advisors David Beecroft, editor of Motor Age and Automobile, and C. G. Sinsabaugh.

The new contest board promises to be a very active and efficient committee. Chairman Ballou served in the same capacity last year and the other members are experienced in racing matters. Callendar was head of the C. A. C. contest board in 1914, Hay has been starter for the Indianapolis international sweepstakes for the past 3 years, Robbins at one time was a driver on the Abbott-Detroit team and Patterson is the backer of Ralph de Palma.

The C. A. C. contest board has a most strenuous season ahead, as it will be in charge of the Elgin road races, the three meets to be held on the speedway and at least three reliability runs.

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Fostoria Price Fixed at $675

FOSTORIA, OHIO, Feb. 28—The price of the new Fostoria light car has been fixed at $675. It has 108-in. wheelbase and the engine is 27 hp. Roadsters, coupes, speedsters and delivery wagons, ranging in price from $495 to $825, are built on the same chassis. These cars are manufactured by the Fostoria Light Car Co., this city.

Studebaker Earns $9,067,425

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Sales Amount to $56,539,006, a Net Gain of $13,094,782—46,845 Cars Sold

SOUTH BEND, IND., Feb. 26—The fifth annual report of the Studebaker Corp. for the year ending Dec. 31, 1915, shows net sales of $56,539,006.23, as compared with $4,344,223.41 in 1914, a gain of $13,094,782.82, or 30.1 per cent. An increase of 87.2 per cent was made in net profits, after reserving an increased amount for depreciation and after payment of interest. Net profits for the year amounted to $9,067,425.28 as against $4,844,663.73 in 1914, a gain of $422,761.55. Deducting the payment of the 7 per cent dividends on preferred stock, the net profits remaining for the common stock amounted to 29.5 per cent during 1915 as against 14.2 per cent in 1914 based on a total of $27,931,600 common stock which was outstanding during all of 1914 and for eleven months of 1915.

War order sales amounted to only one-quarter of the total sales made last year, the amount being $13,000,000 as against $2,000,000 in 1914. Sales of cars have increased over 100 per cent since 1911, when only 22,555 automobiles were sold, whereas last year 46,845 were sold, over 90 per cent of which were delivered to regular customers in the United States and the remainder to regular customers in export markets. About 1300 of these were sold to foreign governments for hospital and other purposes.

The number of cars turned out last year year was 32.1 per cent greater than in 1914, but the volume of the automobile sales showed an increase of only 17.5 per cent on account of the reductions in the prices of Studebaker cars made last summer.

The net expenditures for plant and property in 1915 were $740,444 and depreciation credits were $397,991. In addition to these expenditures charged to capital there was spent for repairs and renewals and charged off to operating expenses $1,244,207, compared with $802,458 spent for the same purposes in 1914. The net working capital on Dec. 31 last was $21,276,837, an increase of $6,505,686.

COMPARATIVE BALANCE SHEETS 5 YEARS

Year Ending Dec. 31st ASSETS	1915	1914	1913	1912	1911
Cash	$ 5,910,062.05	$ 3,539,163.58	$ 1,957,460.53	$ 865,795.46	$ 1,672,434.45
Investments	1,570,098.69	247,654.15	246,508.72	1,075,692.30	1,431,161.78
Receivables	8,585,199.15	6,698,148.07	5,923,793.36	4,958,120.67	5,688,661.02
Inventories	13,062,041.44	13,470,564.49	16,622,228.55	15,730,840.85	14,391,250.99
Deferred charges	161,445.49	709,489.36	1,191,875.16	1,419,347.58	1,114,585.49
Total quick assets	29,288,846.82	24,665,019.65	25,941,866.32	24,049,796.86	24,298,093.73
% Current liabilities	366%	249%	184%	217%	202%
Plant investment	12,400,493.29	12,058,040.03	11,873,297.47	10,594,807.11	10,302,373.03
Trade name, good will, etc.	19,807,276.64	19,807,276.64	19,807,276.64	19,807,276.64	19,807,276.64
TOTAL	$61,496,616.75	$56,530,336.32	$57,622,440.43	$54,451,880.61	$54,407,743.40
LIABILITIES					
Notes payable		$ 1,850,000.00	$ 4,550,000.00	$ 1,400,000.00	$10,050,000.00
Other payables	5,706,510.22	2,493,869.33	2,712,848.31	2,069,728.43	1,953,011.36
5% serial gold notes	*2,305,500.00	5,550,000.00	6,800,000.00	7,600,000.00	
Current liabilities	8,012,010.22	9,893,869.33	14,062,848.31	11,069,728.43	12,003,011.36
Stock sub. co.'s		28,300.00	54,341.29	28,300.00	28,300.00
Preferred stock	10,965,000.00	12,180,000.00	12,650,000.00	13,095,000.00	13,500,000.00
Common stock	30,000,000.00	27,931,600.00	27,931,600.00	27,931,600.00	27,931,600.00
Reserve for future conting'cies	1,500,000.00				
Special surplus account	2,548,654.17	1,230,747.54	823,724.49	417,008.87	
Surplus	8,470,952.36	5,265,819.45	2,099,926.34	1,910,243.31	944,832.40
TOTAL	$61,496,616.75	$56,530,336.32	$57,622,440.43	$54,451,880.61	$54,407,743.40

*Called for payment March 1st, 1916.

COMPARATIVE SALES, PROFITS, DIVIDENDS AND SURPLUS

Year Ending December 31st	1915	1914	1913	1912	1911
Number of automobiles sold	46,845	35,460	35,410	28,523	22,555
NET SALES, automobiles, vehicles and harness	$56,539,006.23	$43,444,223.41	$41,464,949.82	$35,440,327.41	$28,487,847.29
Deduct cost of manufacture, selling and general expenses	47,045,582.77	37,870,999.25	38,834,923.69	32,243,767.19	25,907,499.23
Reserve for depreciation	397,991.01	361,794.01	230,356.84	193,076.34	159,395.70
NET EARNINGS ON SALES	9,095,432.45	5,211,430.15	2,399,669.29	3,003,483.88	2,420,952.36
Add: Other income	152,942.85	133,965.44	83,465.40	122,392.27	85,528.32
TOTAL NET EARNINGS	$ 9,248,375.30	$ 5,345,395.59	$ 2,483,134.69	$ 3,125,876.15	$ 2,506,480.68
Deduct: Net interest paid	49,187.16	414,940.44	484.948.78	444,527.33	456,419.65
Premium on preferred stock	84,234.13				
Discount and com. serial notes	47,528.73	85,791.42	93,773.02	83.675.00	
NET PROFITS FOR YEAR	$ 9,067,425.28	$ 4,844,663.73	$ 1,905,412.89	$ 2,597,673.82	$ 2,050,061.03
7% preferred stock dividends	830,445.00	869.050.00	901.075.00	930.825.00	708,750.00
Earnings on common stock	8,236,980.28	3,975,613.73	1,004,337.89	1,666,848.82	1,341,311.03
% on amount outstanding	29.5%	14.2%	3.6%	5.9%	4.8%
Transferred to special surplus account	1,317,906.63	407,023.05	406,715.62	417,008.87	
Less common stock dividends	1,396,580.00				
Extraordinary items and adjustments not arising from current operations—charged off	*817,360.74	402,697.57	406,939.24	284,428.68	396,478.99
Special reserve for future contingencies	1,500,000.00				
Total	$ 5,031,847.37	$ 809,720.62	$ 813,654.86	$ 701,437.55	$ 396.478.99
ADDED TO SURPLUS	3,205,132.91	3,165,893.11	189,683.03	965,411.27	944,832.04
Previous surplus	5,265,819.45	2,099,926.34	1,910,243.31	944,832.04	
SURPLUS ACCT. DEC. 31st.	$ 8,470,952.36	$ 5,265,819.45	$ 2,099,926.34	$ 1,910,243.31	$ 944,832.04

*These charges have adjusted all accounts to a clean, conservative basis.

Gasoline Prices Soar in Europe

Sells at 45 Cents Per Gallon in London District—Doubles in 3 Years

PARIS, Feb. 15—Gasoline has taken another leap in both France and England. In London district it is now selling retail at 2s. 6d. per gallon, which at present rate of exchange is equivalent to 45 cents per American gallon. This is the highest price in the history of England, and the highest price in European countries, Germany excepted. The direct result of this increase has been a curtailment of motoring; the use of cars for any other than utilitarian purposes is very small indeed. As, however, the use of automobiles in Great Britain for business and professional purposes is very extensive, the high cost of gasoline has called forth loud-voiced protests. Before the war, and before the government put a tax on gasoline, it was selling in England at 1s. 2d., or 28 cents per gallon; thus the price has more than doubled in a period of three years. There is considerable resentment against the few companies controlling the gasoline situation in England, motorists considering that the increased selling price is altogether out of proportion to the increase in freight and insurance. There is no doubt that when normal conditions are again established there will be a very strong feeling in favor of the use of benzole in place of gasoline. There is not much possibility of the rise of alcohol as an automobile fuel in England.

44 Cents in France

France has also had to stand for a rise in the price of gasoline, the refiners recently having decided to put $1 per 100 liters on gasoline and 60 cents on kerosene. The retail price averages 42.5 to 44 cents per American gallon. This excludes the city of Paris, where there is a special local tax artificially increasing the price of gasoline. For the first time in the history of motordom gasoline is cheaper in France than it is in England. This is partly explained by the fact that in England a government tax has been placed on gasoline, while in France the tax has undergone no change.

A Government Inquiry

The situation in France is considered so serious that a sub-commission of the Ministry of Commerce has been entrusted with an inquiry. This commission met the refiners before the present rise went into effect and was able to arrange that the price of kerosene should only be increased 3 francs (60 cents) instead of 5 francs ($1) per 100 liters. The projected increase in the wholesale price of gasoline was carried through, however, with a provision that in case the retailers' increase was disproportionate to the wholesale increase the refiners would undertake to sell to any municipal authorities at wholesale rates.

Grant-Lees Gear Co.'s Output Increases Over 400 per Cent

CLEVELAND, OHIO, Feb. 26—The output of the Grant-Lees Gear Co., East Sixty-ninth Street, this city, has increased over 400 per cent in the last three years. The capacity of the factory is now 120 complete transmissions per day, and the company is furnishing transmissions for some of the best automobiles in the country. Three years ago the company did largely a jobbing business in gears, but after a study of conditions in the industry experts in gear work were secured and the present flourishing business was started on its way.

Reliance Engineering Extends Scope

LANSING, MICH., Feb. 26—A further extension of the Reliance Engineering Co. has tagen place. The National Engineering Co., Saginaw, Mich., one of the largest grinding and finishing concerns in the country, has been bought out and its entire equipment of machines, tools, etc., also its entire working force of more than 100 men, will locate here in the plant formerly occupied by the Olds Gasoline Engine Co., which belongs to the Reliance interests.

The Reliance company has taken over about half a dozen manufacturing concerns during the past six months, among them the Seager Engine Works, the Michigan Crank Shaft Co. being the biggest. Further extensions of the Reliance company are likely to take place this year.

General Motors Output Statistics

NEW YORK CITY, Feb. 28—The number of cars and trucks built by the General Motors Co. during the six months up to Jan. 31, 1916, was 62,468, compared with 31,608 in the 1915 period, and 76,068 cars for the year ending July 31, 1915.

New York Chalmers to Move

NEW YORK CITY, Feb. 24—The Chalmers Motor Co., Detroit, Mich., has leased for the local branch the Wendel Building on the northwest corner of Broadway and Fiftieth Street, this city. It is a three-story structure. It is stated that two or three more stories will be added.

Name Now Johnson Bronze Co.

NEW CASTLE, PA., March 1—The American Car & Ship Hardware Mfg. Co., this city, has changed its name to the Johnson Bronze Co., with its main office and factory in this city. Its plant is being enlarged.

Porporato Called to Colors

Racing Driver Now in Italian Ambulance Corps—Other Drivers in Service

PARIS, Feb. 28—Jean Porporato, whose Sunbeam took second place at Chicago last year, and who is a well-known figure on American race tracks, has had to obey the martial call and is now wearing the uniform of an Italian soldier. Although Porporato became mechanically interested in automobiles as soon as he left school, and has been race driver and tester for Minerva, Gregoire, Berliet, Sunbeam, F. R. P., and other firms, the military authorities have placed him in the ambulance corps, with which body he is now serving on the Italian front.

After nearly eighteen months' service as an automobile driver on the French front, during which period he has had numerous miraculous escapes, Albert Guyot has just been transferred to the aviation section of the French army. Guyot learned to fly years ago, being one of the first men to mount a Bleriot monoplane, but nevertheless did not find it an easy matter to get a transfer from one branch of the army to another. He is now pilot of a Nieuport scout machine, capable of 120 miles an hour, his dangerous and exciting job being the bringing down of German machines which venture over the French lines.

Kennington to Leave for England Early in April

NEW YORK CITY, March 1—W. O. Kennington, for the past five years assistant chief engineer of the Remy Electric Co., will leave with his family for England the fore part of April. Mr. Kennington is offering his services to the War Office but as yet has not been assigned to any definite post.

He has been in America for about seven and a half years, coming from the English-Simms to the American-Simms and thence to the Remy company, and has been with the latter for about five years.

Mr. Kennington is engaging in business with W. H. Johnson, who is the European agent for the Remy company.

Murray Mfg. Gets Kemiweld Plant

DETROIT, MICH., Feb. 26—The J. W. Murray Mfg. Co., which makes sheet metal parts for automobiles, and which is now located on Clay Avenue, has acquired the Kemiweld plant of the Detroit Can Co., and will locate there shortly. It will provide much larger manufacturing space, and the Murray company intends to add a large force of men.

Louisville Show Success Spells Splendid Sales Season in South for 1916

Hundreds of Optimistic Dealers from All Parts of Kentucky and Southern Indiana Visit Show—30% Business Gain Over 1915 and 30,000-Car Registration Predicted

LOUISVILLE, KY., Feb. 26—Optimism is in evidence everywhere at the ninth annual exhibition of the Louisville Automobile Dealers' Assn., which opened last Monday evening and closes to-night. Indications point to a splendid season following the show. It is the largest motor exposition to hold attention south of the Ohio river, and, as usual, is staged in the First Regiment Armory, which covers 54,000 sq. ft. of floorspace. The big military building is one of the leading show places of its kind in the country, there being no pillars to obstruct the view. It presents a most attractive appearance.

43 Exhibitors

Forty-three exhibitors are showing forty-one different makes of gasoline passenger cars, twenty-eight more than last year, four electrics and nine commercial vehicles. The Old Hickory truck, built by the Kentucky Wagon Mfg. Co., a local concern, and the Dixie passenger car, made by the Dixie Motor Car Co., at the plant of the Kentucky Wagon Mfg. Co., are displayed for the first time at a show this season.

Many Dealers at Show

Factory representatives from all of the big automobile centers are in attendance. Hundreds of dealers from all parts of Kentucky and Southern Indiana also are daily visitors at the show. While the local exhibition, in the main, is a retail proposition, the Louisville distributors and factory representatives have closed many new contracts with sub-agents and dealers for the coming year.

One of the features of the Louisville Show is the great interest being manifested in the commercial vehicle by Kentucky merchants and manufacturers who are buying more trucks than ever before.

30% Gain Over 1915

Business is much better than it was at this time last year. A conservative estimate, based on interviews with dealers, points to an increase of about 30 per cent so far this year over the same period in 1915. A few dealers say business is 50 per cent better, but this is the exception rather than the rule.

Owing to the tendency of some of the dealers to keep their sales secret, it is impossible to give any figures as to the number of cars sold during the show, but all of them agree with the prediction of an official of the Commissioner of Motor Vehicles' office that 10,000 new cars will be sold in Kentucky during 1916. Some say that 15,000 automobiles will be sold in the State this year.

In Louisville, sixty-three different makes of cars are handled by forty-two dealers and distributors. There are approximately 620 dealers and agents in the Bluegrass State, including about 180 Ford agents, 100 Overland agents and seventy-five Buick agents.

THE STANDING OF KENTUCKY AMONG THE FOLLOWING SOUTHERN STATES IN FIELD CROPS AND LIVE STOCK

Kentucky, Tennessee, Virginia, South Carolina, North Carolina, Florida, Alabama, Arkansas and Louisiana

Horses and mules, number head, 672,000	First
Poultry, $16,072,767	First
Bees, colonies, 152,991	First
(Seventh in United States)	
Sheep, number head, 1,267,000	First
Hogs, number head, 1,507,000	First
(Tenth in United States)	
Apple production, bushels, 7,368,499	First
(Fifth in United States)	
Corn, bushels, 74,825,000	First
(Eighth in United States)	
Tobacco, pounds, 281,200,000	First
(First in United States)	
Cabbage, acres, 3028	Second
Onions, acres, 1959	Second
(Ninth in United States)	
Wheat, bushels, 9,860,000	Second
Potatoes, bushels, 2,450,000	Second
Cattle, number head, 909,000	Third
Apple trees, 5,538,267	Third
Milch cows, 382,000	Third
Hay and forage, tons, 674,000	Third

A Wide Territory

Louisville's show is the greatest motor event of the year in Kentucky and marks the opening of the selling season in this section of the country. The district embraced by the local agents, factory representatives and branches, as a rule, covers Southern Indiana, the entire State of Kentucky, and in some instances Tennessee, the western portions of West Virginia and Virginia.

Louisville is an automobile city, not in the producing sense, but from the standpoint of use and distribution. As a distributing point, with its excellent railroad facilities, it ranks with the leaders. A number of the largest factories and tire concerns in the United States maintain branches here.

The majority of dealers have a larger list of live prospects, who have promised to sign up in the spring, than ever before. The lack of deliveries has cost several dealers good sales. As a rule, the Southerner is slow to make up his mind upon the question of buying a car, but, once settled, he wants the machine immediately. When he can't get a certain make he wants, he visits another garage and finds another car in the same class that will satisfy him.

Trucks Sales Increase

There is one feature that stands out more prominently than any other in connection with the industry in Louisville, that is, the rapid strides which the commercial vehicles have made in popularity and usefulness. The number of horse-drawn vehicles on the streets is fast diminishing.

It is outside of the cities where local distributors are doing the bulk of their business. The farmers—the majority of them—and the people living the small towns, want a car selling in the neighborhood of $1,000, and they prefer a touring car, though there is a demand for the runabout. The car listed for $800 and under finds a ready market South of the Ohio River, provided it has a well-known company behind it.

50% Gain Predicted

The automobile in Kentucky has experienced its most prosperous year. During the year 1915, and to date in 1916, there has been a greater percentage of increase in automobile registrations than ever before. Five years ago an increase of 100 per cent meant about 2500 cars; to-day it means 20,000. The prediction is made from the Commissioner of Motor Vehicles' office that the Bluegrass State will absorb 50 per cent more cars during 1916 than in 1915.

The prospects are that 30,000 motor vehicles will be registered in Kentucky by Jan. 1, 1917. There is not a county in the State that does not register automobiles to-day, although 1915 is the first year to show this. Better roads throughout the State, and the Dixie and Jackson Highway movements are believed to be responsible in a large measure for the sale of thousands of cars.

The total State registration for the year 1915 was 19,500 automobiles and trucks, the fees collected amounting to $114,184.07.

10,000 New Cars

Hugh Ramsey, Deputy Commissioner of Motor Vehicles, who is an authority on the Kentucky automobile situation, says:

"About 10,000 new cars were registered during 1915, which paid only the proportional part of the fee to Jan. 1, 1916. These cars will pay the full fee, averaging $7.50, making a total of $150,000 for 1916. Over 1500 cars have been registered for 1916 to date, and a sale of 10,000 cars is anticipated for the year, which will contribute $50,000 in license fees, making an estimated total of $200,000 for the year on automobiles alone. This is more than one-third of the money derived from the so-called '5-cent tax.' There has been more money

collected in one week in 1916 than the entire year of 1910. The total receipts for the month of January were $90,384, against $36,000 for the same period in 1915. If this proportionate increase is maintained through the year the estimate of $200,000 will be largely exceeded."

The increase in numbers in the State is largely due to the purchase of small cars in the rural communities. The year saw the advent of the jitney bus, and probably a few hundred registrations were due to that, but they have not had the effect predicted. There seems to be some cause for alarm by the railroad systems over the inroads on their passenger business by the automobile. Instructions have been issued by the larger systems to gather all information possible bearing on the question, in an effort to determine to what extent it menaces, and to work out, if possible, a remedy.

Louisville's Importance

The estimated population of Louisville proper to-day is 305,000; within a 10-mile radius, 416,000. The city is admittedly the largest exporting center in the world for tobaccos and whiskies. It is the largest grain market in the country outside of Chicago—especially for bona fide transactions—as well as the largest live stock market, especially in the matter of sheep and lambs, while in the matter of Southern fruit distribution, including pineapples, watermelons and the like, it is the most important in the United States. This city also is the principal mahogany market and manufacturing center in America.

With possibly one exception, Louisville is the largest exporter of agricultural implements in the world. Other great industries here are: porcelain-lined bath tubs, chewing gum, cotton seed oil, cotton seed products, organs, window shades, loose leaf ledger supplies, boxes, barrels, millinery, stoves, hardware, cement, paints and varnishes.

Record Clearing Reports

Total exchanges through the Louisville Clearing-house for 1915 established a new high record. The total for the year was $742,390,281, as compared with $667,947,515 in 1914, an increase of $74,442,766. Clearings for the closing month of the year amounted to $78,535,342, the highest record for a month in the history of the clearing-house, and a gain of $26,000,000 as compared with the corresponding month in 1914. For the last quarter of the year clearings aggregated $218,230,782, as compared with $146,858,562 for the same quarter of 1914.

Some Kentucky Statistics

Kentucky, with a gross area of 40,598 square miles, had a population in 1910 of 2,289,905. It ranked fourteenth among the forty-nine states and territories. According to the latest estimate of the census bureau, for Jan. 1, 1916, the State now has 2,372,412 inhabitants.

In 1909, from the last government figures available, the total value of the manufactures of the State, exclusive of the products of the neighborhood and hand industries, amounted to $223,754,000.

Kentucky, because of immense whisky production, pays Uncle Sam the fourth largest revenue in the United States. Of the total of $33,653,848 paid by this State in 1915, according to the Internal Revenue Commissioner's report, the biggest item was $28,642,911 from distilled spirits, this being about one-fifth of the amount collected from this source for the whole country. In addition to this, fermented liquor paid nearly $1,000,000 to the Internal Revenue Department in 1915.

$125,000,000 in Distilleries

These figures to some extent give an idea of the importance of liquor-making in a State famous from its earliest days for this industry. It is estimated that over $60,000,000 has been spent in distillery and brewery property in this State. It is further estimated that the operating capital of Kentucky distilleries aggregates something like $125,000,000.

The report of the United States Department of Agriculture estimated the 1915 tobacco crop in Kentucky at $27,899,200. Tobacco to-day is selling from 1 to 4 cents higher than it was a year ago.

This means prosperity in Kentucky, for tobacco is one of the State's chief products, and there is no question but what a big tobacco business influences the sale of automobiles and results in a greater demand for cars.

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Texas Dealers Confer on New Law

DALLAS, TEX., Feb. 26—Future contracts of automobile general agents and subdealers over the State will eliminate territorial specifications and price stipulations. This it is said is the result of a conference at Austin last week with the attorney general for Texas and Dallas automobile dealers.

J. W. Atwood of the Buick company, who headed the aggregation of automobile dealers, said that the matter with the attorney general was amicably settled. Heretofore the contracts, some of them specified the territory an agent should sell in and the price he should receive for the car. These objections were raised by the attorney general.

This conference at Austin resulted in the filing of a number of suits against automobile concerns in which it was alleged the anti-trust laws of Texas were being violated. As a result of these suits it is declared the automobile industry in Texas has been hurt.

Syracuse Show Sells Many Cars

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Prosperity in Central New York Section—30,000 Cars for 1916

SYRACUSE, N. Y., Feb. 26.—Some measure of the prosperity which is sweeping through Central New York was revealed at the show held in this city during the week ending to-day. Without exception, dealers and distributors expect to far exceed in 1916 their sales for 1915. Their optimism is based on the fact that during the year gone by manufacturing industries in the principal cities in this section has shown a consistent increase, that farmers are well out of debt, crops have been good, bank balances are heavy and there is promise of an early spring with early touring weather.

During 1915, the five counties which are contiguous to Syracuse, and from which Syracuse dealers draw their trade, absorbed 20,467 cars, according to figures supplied by the Secretary of State. These counties, with the number of cars registered are: Onandaga, 7270; Jefferson, 2943; Oswego, 1552; Cortland, 1368; Cayuga, 2326; Madison, 1106; Oneida, 3802. It is confidently expected that the average gain for 1916 will be between 25 and 30 per cent and that the territory should absorb nearly 30,000 cars. The combined population of these counties is 635,145, and of Syracuse itself, 149,000.

The show was the eighth annual affair and was staged by the Syracuse Automobile Dealers Association. Despite inclement weather during the latter part of the week, attendance was good, the average being nearly 5000 per day. The show was held in the State armory.

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Portland Mfg. Co. Restarts

FLINT, MICH., Feb. 21—The Portland Mfg. Co., originally located in Portland, Mich., where it was burned out in May, 1915, has restarted in business here. The company which is capitalized at $12,000, will make besides electric and springless-gearless types of washers, a number of special accessories for the Chevrolet and Dort cars. The officers of the company are Arthur G. Lodewyck, president; Frank D. Lockwood, vice-president and Harry C. Shute, secretary-treasurer. Manufacturing quarters have been secured at 859 Patterson Street.

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Cannot Revoke License

LANSING, MICH., Feb. 28—Attorney-General Fellows has ruled that the Secretary of State has no right or authority to revoke a chauffeur's automobile license for violations of the automobile law.

E.V.A.A. May Merge with N.E.L.A.

Work of Electric Vehicle Assn. To be Continued Under Auspices of National Body

NEW YORK CITY, Feb. 28—The Electric Vehicle Assn. of America has been invited by the National Electric Light Assn. to affiliate with it as a section, to be known as the Electric Vehicle Section, and that in the event that favorable action is taken by the E. V. A. A., its members will become members of the National Electric Light Assn., and the E. V. A. A. will be legally dissolved. A special meeting has been called to consider the invitation at the office of the association on March 10.

It is the present intention to discontinue any further meetings of the E. V. A. A. body, the members attending the regular monthly meetings of the N. E. L. A. The latter association expects to hold an exhibition May 22 to 26 at its convention in Chicago, and arrangements will probably be made for parking space either in Grant Park opposite the hotel, or some other nearby location for the display and demonstration of electric vehicles.

The Electric Vehicle Assn. of America was organized six years ago and now has a membership of 1150. The N. E. L. A. has a membership of 15,000 and has been in existence for forty years.

Bay State to Fight for Lower Gasoline Prices

BOSTON, MASS., Feb. 24—Massachusetts motorists have taken up the cudgels in the fight to reduce the price of gasoline in New England. At the request of the Bay State A. A. of Boston, Representative Thomas J. Giblin of the Massachusetts Legislature, has put in a resolution requesting that action be taken. He has asked the Legislature to pass the following:

> Resolved, That the motor industry has given such steady employment to so many thousands of our citizens, men and women; has increased the tax values of the State by many thousands; and has in other ways done so much to add to our prosperity, be it
>
> Resolved, That the Massachusetts Legislature send a resolution to its Senators and Representatives at Washington requesting them to take such action as will result in lowering the price of gasoline in the East, where its high price now jeopardizes the motor business of Massachusetts and gives Western States an unfair competitive advantage over our motor business firms and individuals.

50 Cents per Gallon

At the annual banquet of the Automobile Club of Springfield, Mass., which was attended by 750 members and friends, Thos. L. Hisgen, former independent party candidate for the presidency, who was the principal speaker, asserted that if action is not taken the price of gasoline will go to 50 cents in a year. Hisgen is an independent oil operator. He stated that the percentage of gasoline taken from crude is higher now than ever before; that figures based on facts prove that there is no oil shortage; that the trusts aim to stifle competition and maintain high prices after the war; that the company of which he is president refused an offer from an agent of the Allies to sell all the gasoline they could get at a profit of 4 cents per gallon; that he believes the committee appointed by the Bureau of Commerce to investigate gasoline prices is incompetent, and that the Bureau of Commerce refuses to divulge the names of the members.

Timken New Seamless Tube Plant Working Full Time

CANTON, OHIO, Feb. 26—The new seamless steel tube plant of the Timken Roller Bearing Co., recently completed at an expenditure of about $500,000, is now in full operation, 24 hr. a day. It is an all-steel structure of the standard mill type. The piercing and rolling mills with their accessories are of the latest design, embodying a number of patented features which make for greatly improved hot finished tubes. The cold working department includes pickle house, annealing furnaces, pointers, draw benches, straighteners, cutting-off machines, and many other things which make the plant one of the most complete in the world.

Wardell Detroit Steel Products Sales Manager

DETROIT, MICH., Feb. 26—H. F. Wardell has been appointed general sales manager of the Detroit Steel Products Co. in place of P. A. Smith, who resigned. Mr. Wardell was formerly office manager of the company. Previously he was with Albert Kahn, the architect, also with the United States Gypsum Co.

Hupp Makes Output Record

DETROIT, MICH., Feb. 24—The biggest day of the winter season at the Hupp Motor Car Co., was on Thursday, Feb. 17, when 101 Hupmobiles were made. Although the plants here and in Jackson are working to capacity, the company is still over 700 orders behind the immediate demand.

Struggle for Race Selection

Elgin and Santa Monica Contend for Vanderbilt and Grand Prize

Chicago, Feb. 29.—The battle for the honor of promoting the Vanderbilt cup and grand prize road races for 1916 is on. At the annual meeting of the Elgin association, held last week, the directors and stockholders voted to apply for the sanctions for the two classics and directed Joseph Callendar a member of the contest board of the Chicago Automobile Club, to open negotiations immediately with the Motor Cups Holding Corporation, which controls the two trophies.

Santa Monica already is in the market for the two blue ribbon events.

According to the plans of the Elgin promoters, the Watch City meet will be of 8 days' duration this year, with 4 days of racing. The speed carnival will open Saturday, Aug. 12, with the Vanderbilt cup, and close the following Saturday, Aug. 19, with the grand prize. The C. A. C. cup event will be run on Tuesday, Aug. 15, and the Elgin National trophy contest on Thursday, Aug. 17.

At the annual meeting, which was one of the most enthusiastic sessions ever held by the association, no decision was reached regarding the distance of the four events or the piston displacement limit to be placed on the entries. These are matters that fall under the jurisdiction of the contest board of the Chicago Automobile Club.

The Elgin promoters have agreed to raise $10,000 of the $24,000 to be offered in purses by the sale of 1,000 season tickets at $10 apiece. Chicago race enthusiasts also have promised to sell the same number of tickets in advance.

The Elgin course has weathered the ravages of winter in splendid shape and very little work will have to be done on the roads to put them in condition for fast driving.

Business Good at Newark Show

NEWARK, N. J., Feb. 28—Newark's show ran true to 1916 form; it was the biggest and best it ever had, which is the experience that every other show-city has had this year. Paid admissions were double what they were a year ago despite an uninterrupted spell of intense cold alternated with driving rain.

The interest was greater, sales were more frequent, and there was a business-like air that was not so pronounced at previous shows.

The opening was Saturday, Feb. 19, and from the moment the doors were unlocked until the lights were turned

out the building was a solid mass of enthusiasts. Many were car buyers but more probably were there out of curiosity, because the majority of the attendance on the opening night is complimentary.

The large attendance through the following week was no doubt due in large measure to the wholesale purchase of tickets by the various exhibitors for distribution among owners and prospects. The regular price of admission was 50 cents, but exhibitors could purchase blocks of 100 for $25. Many dealers bought 500 or more.

Interest in the show was stimulated by making every night except the last a special night. Opening night Gov. James F. Fielder was scheduled to make an address, and his failure to put in an appearance was not the fault of the management. Monday night the Mayor was there to act as host. Tuesday was Washington's birthday and a special musical program was arranged for the night. Wednesday was society, military and naval night—no extra admission was charged. Thursday was club night, the New Jersey Automobile and Motor Club acting as hosts to the 10,000 members of affiliated clubs of New Jersey. Friday was commercial vehicle night and the Motor Truck Club of New Jersey was host to the owners of motor trucks.

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Chandler Profits $933,217

NEW YORK CITY, Feb. 24—The handler Motor Car Co., the old company, reports to the New York Stock exchange for the year ended Dec. 31, 1915, net profits of $933,217 as against $321,821 in 1914 and $42,232 in 1913. The new company up to Jan. 1, 1916 had $1,613,515 cash in the bank and on hand and a surplus of $173,450.

A comparison of the earnings of the old company for 1913, 1914 and 1915 is given in the following tabulation:

	1915	1914	1913
Gross profits ...	$1,507,360	$706,123	$154,461
Other income...	101,125	43,283	13,034
Total income.	$1,608,485	$749,406	$167,495
Expenses	641,733	423,585	123,363
Depreciation of plant	33,534	4,000	1,900
Net profits...	$933,217	$321,821	$42,232

The balance sheet of the Chandler Motor Car Co., new company, as of Jan. 1, 1916, follows:

Assets	
Real estate, buildings and equipment	$223,928
Good will and organization	5,000,000
Investments	48,240
Cash in banks and on hand	1,613,515
Accounts and notes receivable	138,828
Inventories, at cost	622,644
Prepaid expenses	14,318
Total	$7,661,475
Liabilities	
Capital stock	$7,000,000
Accounts payable	410,152
Deposits from dealers on contracts	63,725
Reserve for taxes and contingencies	14,146
Surplus	173,450
Total	$7,661,475

Five Firms Have Credit Systems

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Banks Support Schemes for Selling Cars on Installment Plan to Approved Buyers

DETROIT, MICH., Feb. 28—Selling automobiles on installments or deferred payments has now become a standard part of the business of dealers selling at least five makes of automobiles. Doubtless other makers will be added to the list from time to time, but the five so far in line on the proposition are Overland, Studebaker, Chalmers, Maxwell and Paige, all large producers, and their announcements of arrangements on behalf of their dealers came out in about the order named. In every case the car maker has no financial interest in the credit company that buys the notes taken in by the dealers, but the maker has simply made the proper arrangements so that the dealer may do this class of business on a proper and logical basis.

In every case so far made public, an old and firm banking house is back of the arrangements, and while the plans differ considerably in their details, they follow about the same general idea of having one-half to one-third of the price of the car paid down and the balance in eight monthly payments. The banking firm then buys these notes from the dealer. Hence the dealer has a ready outlet for this paper and does not have to use his local credit for the purpose. Undoubtedly the installment idea will increase the sales of cars, for it opens up that field in which there are many who have enough to buy a car but cannot pay it all out at once.

Credit Houses Back Scheme

Following are the credit houses back of the time sales of the five cars mentioned:

Overland—Guaranty Securities Co., Toledo, Ohio.

Chalmers—Agricultural Credit Co., Chicago.

Studebaker—Commercial Investment Trust, New York and St. Louis.

Maxwell—American Commercial Co., Cleveland.

Paige—Bankers' Commercial Corporation, New York.

Up to a short time ago it was generally thought that automobiles could not be marketed successfully on the installment plan basis, because it was believed there was too much risk of damage and depreciation to the vehicle between the time of first payment and final payment. However, the new arrangements seem to overcome this difficulty.

However, with the wider use of cars by the general public and the need of an adequate method of doing such business so as to save the dealer from haphazard methods that might lose him much money or even wreck his business have decided some of the big producers of cars to make arrangements with banking interests to finance such transactions. Doubtless the great earnings of the automobile companies during the past year and the constantly increasing market for cars were big factors in bringing to the attention of big banking houses the matter of financing time sales, just as these factors have induced many moneyed interests to invest heavily in the expanding motor car factories themselves.

Arrangements Differ Slightly

Although the arrangements differ in details, the general scheme of these deferred payment plans is the same. Usually the dealer is required to take one-third or one-half of the list price of the car down, and the balance in eight monthly payments. The cost of insuring the car against fire, theft and transportation loss is added, as well as 6 per cent interest on the notes which the buyer gives. This is a cash sum that must be paid at the time the initial payment is made. Then the dealer indorses the notes and sends them to the banking house, which buys them from him less a brokerage charge that ranges from 2 to 3 per cent in most cases. In one or two instances the banking firm sends immediately the entire amount of the notes less brokerage, and in others an amount of $100 to $200 is withheld and the dealer given a deferred certificate for this. He can cash this certificate through the banking house when the customer has paid the last note, or if he wishes he can use it immediately by sending it to the car manufacturer, who will accept it on the purchase of more cars, less a discount of 5 per cent.

Buyer Specified

For this kind of business the plan laid down usually specifies the kind of person whom the dealer can sell on this deferred payment basis, and since he indorses the notes he is reasonably sure to satisfy himself that the party is able to pay for the car as agreed. Certain investigation procedure is given the dealer and usually all the necessary forms and notes are furnished him, so that the sales are made in a strictly uniform manner and in accordance with the rules the dealer is instructed to follow. He will, of course, follow them, as he wants the notes to be taken by the credit firm.

In most instances the plan does not interfere with the dealer's local banking arrangements, and there are no restrictions if he wishes to finance the installment sales through his local bank he is at liberty to do so. Usually the dealer

needs all of his local credit for taking in the shipments of cars as they come from the factory, and the new scheme is a method whereby the dealer can take care of a much larger volume of credit sales than he would be able to do were he entirely dependent upon his local credit. Some of the car makers, however, do not favor the dealer financing any of their time sales through local banks.

Many will wonder why the banking firm will not remit them the entire face value of the notes less the brokerage, instead of paying all but about 10 per cent and giving a deferred certificate for that, paying it when the car is fully paid for. This is because it is held that the dealer must have some interest in the transaction after he has made the sale and taken the notes. Knowing that the balance of his money is dependent upon the payment of the last note, he will keep in touch with the customer and see that the latter keeps up his payments.

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Pennsylvania Rubber Has $4,000,000 Business

CONSHOHOCKEN, PA., Feb. 24—The stockholders of the Pennsylvania Rubber Co., at the annual meeting elected the following officers for the ensuing year: Chairman of board, Herbert DuPuy; general manager, S. G. Lewis; secretary, G. W. Shively; and assistant treasurer, C. G. Morrill. The directors are Herbert DuPuy, H. W. DuPuy, C. M. DuPuy, S. C. Lewis, and G. W. Shively.

The company's report for the season of 1915, shows approximately a $4,000,000 business. Additions will be made to the factory facilities to take care of a production of not less than 2000 casings a day.

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157 Chalmers Shipped Feb. 23

DETROIT, Feb. 23—All former shipping records were broken by the Chalmers Motor Co. to-day, when 157 Chalmers were shipped. The daily shipping schedule calls for 125 cars, but it is better than that most of the time.

Army Truck Bids Opened

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Full Specifications Issued for Eight Trucks Needed by U. S. War Department

WASHINGTON, D. C., Feb. 26—Bids for supplying the U. S. Army with eight gasoline trucks will be opened in the office of the Chief of Ordnance, U. S. A., War Department, this city, on March 2. These trucks are to be four-wheel-driven with locking differentials whose normal capacity shall be 5000 lb., whose weight with body shall be about 6500 lb., whose speed shall be 15 m.p.h. maximum and whose power shall be 30 hp.

In the specifications of these vehicles, they are required to be capable of negotiating surfaces off the roads and to climb grades of as much as 15 per cent. Axles must be forgings and live axles should be of the floating type. There must be brakes in each wheel and also on the transmission, capable of holding the truck on a 25-per cent grade. Load distribution must be so that not less than 30 per cent or more than 45 per cent falls on the front wheels. The safety factor must permit 20 per cent overloads. The carbureter must be water-jacketed and fitted with a hot air connection. The tread must be 56 in. and the clearance 15 in., 8 in. under the brake drums.

Spark and throttle levers are required to be separate from the steering column. An accelerator, if used, must be to the right of the pedals. The radiator must be mounted on springs and preference will be given to the vertical tube type. It must be at the front and fitted with a drain. Circulation should be by pump, so arranged as not to interfere with thermo-syphoning. The engine should be supported on three points.

The engine is required to be under the hood, of four-cylinders, vertical and with inclosed valve mechanisms. The horsepower formula used is $HP. = .28N(b - 1.18)(s + b)$, in which N is the number of cylinders, b, the bore in inches and s the stroke in inches and must equal 30 by this formula. Towing hooks, after the Ordnance Department's specifications, spring-mounted, must be fitted fore and aft. A spur- or bevel-gear type of differential is required.

Shaft drive is required, worm drive being preferred. Universals may not be exposed. Thirty gallons of gasoline must be carried, 25 in a main tank and 5 in a reserve tank. A selective gearset is required with a total low reduction of from 30 to 40 to 1.

If magneto ignition is used, there must be a battery reserve. If an electric starting system is used, a separate storage battery shall be provided for ignition. Electric lighting is required, fed from a storage battery and in addition to the usual lamps, there must be a dash lamp and swinging searchlight on the dash. Torsion and propulsion through springs is considered undesirable. There must be three forward speeds and a governor set at 15 m.p.h.. A speedometer must be provided. No bright metal parts will be permitted. Four-wheel steering is preferred, but not insisted upon. Single tires, 36 by 6 are desired, mounted on cast steel wheels. Deliveries will be made f.o.b. train at Fort Sill, Okla.

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Automobile Club Tests Tankii

NEW YORK CITY, Feb. 28—Results of a certified test on Tankii, a fuel preparation made by the Tankii Chemical Sales Co., Cleveland, Ohio, have just been announced by the Automobile Club of America, under whose auspices the test was made. The report of the technical committee indicates that no increase in miles per gallon resulted from its use. The test was made on the roads in Central Park, the car first being run with gasoline and then with the mixed fuel, the Tankii being in the form of white tablets. One tablet was added to each gallon of fuel.

A run with the mixed fuel showed 13.1 m.p.g., and with the plain gasoline under the same circumstances, 13.4 m.p.g.

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Metal Prices Higher

NEW YORK CITY, Feb. 29—A contraction in the supplies of a few of the metals last week caused prices to soar. Tin advanced over $6 per 100 lb. in one day, reaching a new high mark of $50 per 100 lb. Lead reached $6.50 per 100 lb. yesterday, making a gain of 20 cents for the week. Aluminum kept up its rise, reaching 60 cents per lb. Bessemer steel went up $1.00 per ton to $35.

Pennsylvania crude oil went up to $2.40 a barrel on Tuesday. Reports reaching the oil refiners showed that during January there was a falling off of about 6000 barrels a day in normal runs and shipments, and the advance was made in the hope of making up this deficiency. Competent authorities, however,

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.57	.57	.57	.57	.59	.60	+ .03
Antimony	.44	.44	.43¾	.43¾	.43¾	.43¾	— .00¼
Beams and Channels, 100 lb.	2.17	2.17	2.42	2.42	2.42	2.42	+ .25
Bessemer Steel, ton	34.00	34.00	35.00	35.00	35.00	35.00	+1.00
Copper, Elec., lb.	.28½	.28½	.28½	.28½	.28½	.28½	...
Copper, Lake, lb.	.28½	.28½	.28½	.28½	.28½	.28½	...
Cottonseed Oil, bbl.	9.70	9.55	9.85	9.70	9.65	9.80	+ .10
Cyanide Potash, lb.	.28	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.53	.53	.53	.53	.53	.53	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	.23	...
Lard Oil, prime	.95	.95	.95	.95	.95	.95	...
Lead, 100 lb.	6.30	6.30	6.37½	6.37½	6.37½	6.50	+ .20
Linseed Oil	.76	.76	.76	.77	.77	.77	+ .01
Open-Hearth Steel, ton	35.00	35.00	35.00	35.00	35.00	35.00	...
Petroleum, bbl., Kans., crude	1.30	1.30	1.30	1.30	1.30	1.30	...
Petroleum, bbl., Kan., crude	2.40	2.40	2.40	2.40	2.40	2.40	...
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para	.76	.76	.75	.76	.78	.78	+ .02
Rubber, Ceylon, First Latex, Crepe	.90	.89	.88	.91	.97	.97	+ .07
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb.	42.25	42.63	43.25	43.75	43.75	50.00	+7.75
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

believe that the immense amount of crude oil now held in storage will not find the market until the price has reached $2.50 a barrel.

Crude rubber prices were a little higher with a steady market and a fair demand. Manufacturers did not show much disposition to anticipate to any extent, but the demand for moderate lots was on a fair scale.

Gasoline prices remained unchanged, with higher prices, however, expected. A number of curb brokers in Wall Street are hedging on gasoline. They are buying some oil stocks to cover any rise in gasoline. If gasoline goes up, they figure, oil stocks would also go up, and the profits would reimburse them for the high prices of gasoline. If gasoline went down, on the other hand, they figured they would take their compensation by buying cheaper gasoline, even though their oil stocks dropped a little.

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Indianapolis Plant Sold

INDIANAPOLIS, IND., Feb. 24—The American Motor Realty Co., owner of the site and plant formerly occupied by the American Motors Co., at South Meridan Street and the right-of-way of the Indianapolis Union Railway Co., has sold the property for $70,000 to the Indianapolis Cordage and Implement Co.

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Jeffery Cuts Hours—Raises Wages

KENOSHA, WIS., Feb. 24—The Thomas B. Jeffery Co., this city, has increased the wages of 2000 employees 10 per cent and reduced the working hours to fifty a week for day work and fifty-five for night work.

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Maxwell Man in Orient

DETROIT, MICH., Feb. 24—Walter T. Langwell, of the sales department of the Maxwell Motor Co., sails for Japan and China, April 22, and will make an investigation of the automobile business in the Orient and the possibilities of further extending the Maxwell export trade in that part of the world.

Security Prices Lower

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General Reduction Sets in with Little Activity—New Stocks Issued

NEW YORK CITY, Feb. 28.—Securities prices on Saturday were much lower, failing to hold their advantage of the previous week. In fact, a few of the leading stocks on the New York Exchange have gone under their low marks for 1916. Maxwell common at the present time is a little under its lowest mark this year, which was 63½. The first preferred is now quoting at the lowest price this year, that of 85. The second preferred at 48 is ½ point under its low mark for the year. Studebaker at 140 on Saturday was 1⅞ points below its former low mark while its preferred at 109 was just 1 point lower. General Motors and Willys-Overland have managed to quote above their lowest marks. General Motors, common, especially, is considerably ahead of its 1916 rock bottom price of 415 made on Jan. 7. Its present price is around 476. Its highest quotation was 495, made on Jan. 3. The highest point reached by this stock was 558 in 1915, having risen from 82 the same year. Willys-Overland, common, though considerably under its highest mark made this year, is at the present time about 10 points above the rock bottom price of 199¼. Its preferred has been very steady this year, there being very little difference between its high and low marks.

With the exception of a 5-point rise in Firestone common, the rest of the tire issues last week were lower. Miller Rubber common featured the decline with a 50-point drop. This stock has been subject to large fluctuations. U. S. Rubber common went down 1¼ points to 50½. The new Kelly-Springfield common also showed a decline of 1 point. This company has made a formal application for the listing of its shares on the New York Exchange. It is understood that trading in the issue on the big board will start March 9. In accordance with the provisions of the certificate of incorporation there has been set aside in the special surplus account $75,246, which will be expended in purchasing for retirement and cancellation the 6 per cent preferred stock. There will be $3,758,200 preferred and $5,877,200 common issued.

Another company to have its stock listed on the exchange is the Chandler Motor Car Co. This stock was taken from the curb market and placed on the Exchange board last Saturday. The company is listing $7,000,000 common.

There was a brisk demand for the new shares of the Continental Motor Co. on the Detroit Exchange. This stock is now $10 instead of $100. The bid on Saturday was 27 and it is next expected that a further rise will occur. On the last day the old stock was quoted, it went up to 505 bid, which was a gain of 55 points since Feb. 19.

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Winton Co. Reverses Color System on Its Cars

CLEVELAND, OHIO, Feb. 26—The Winton Co. has reversed the usual procedure, where both light and dark colors are used on closed car bodies and is now putting the light shades above the seat line and the dark shades below. This plan of coloring is believed to make the cars look more cheerful, since the human vision has a tendency to take in the upper half of everything before the lower portion is noted.

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Johnston President of Dealers' Assn.

NEW YORK CITY, Feb. 24—R. H. Johnston, manager of the New York branch of the White Co., was re-elected president of the Automobile Dealers' Assn. of New York. W. C. Poertner of the Poertner Motor Car Co. was elected vice-president, and C. M. Brown was re-elected secretary and treasurer.

Automobile Securities Quotations on the New York Exchange

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	71	82	..
Aluminum Castings pfd	98	100	..	..	..
J. I. Case pfd	75	80	84	86	—1
Chalmers Motor Co. com	..	90	130	150	..
Chalmers Motor Co. pfd	91	93½	99	101	..
Chevrolet Motor Co	..	..	136½	137	+2½
Electric Storage Battery Co	47½	48½	..	..	..
Firestone Tire & Rubber Co. com	375	380	740	750	+5
Firestone Tire & Rubber Co. pfd	108	109½	113	..	+1
General Motors Co. com	88	90	476	480	—1
General Motors Co. pfd	92⅜	95	113	115	—1
B. F. Goodrich Co. com	31¼	31½	69	71	—3½
B. F. Goodrich Co. pfd	96⅝	98½	113½	114½	+ ½
Goodyear Tire & Rubber Co. com	188	191	342	347	..
Goodyear Tire & Rubber Co pfd	101	102½	116	117½	..
Gray & Davis, Inc., pfd	..	..	..	..	..
International Motor Co. com	..	..	20	25	—2
International Motor Co. pfd	..	..	32	38	—3
Kelly-Springfield Tire Co. com	104	105	..	..	..
Kelly-Springfield Tire Co. com. (new)	..	..	70	71	—1
Kelly-Springfield Tire Co. 1st pfd	82	83	95	97	..
Kelly-Springfield Tire Co. 2d pfd	122	127	..	..	..
Maxwell Motor Co. com	24¼	24½	63	64½	—2¼
Maxwell Motor Co. 1st pfd	62	62¾	85	86	—1
Maxwell Motor Co. 2d pfd	25	25¼	48	50	+1¾
Miller Rubber Co. com	158	160	225	240	—50
Miller Rubber Co. pfd	101	103	113½	116	..
New Departure Mfg. Co. com	122½	127	173	176	—1
New Departure Mfg. Co. pfd	105½	108	110	..	—1
Packard Motor Car Co. com	..	99	165	175	—5
Packard Motor Car Co. pfd	95	..	102	†104	..
Paige-Detroit Motor Car	..	..	665	700	..
Peerless Motor & Truck Corp	..	..	26	27	..
Portage Rubber Co. com	34	36	68	71	+3
Portage Rubber Co. pfd	85	95	106	108	—1
Regal Motor Co. pfd	..	..	13	16	..
*Reo Motor Truck Co	11	12	26½	28	— ¾
*Reo Motor Car Co	25¾	26¾	33½	34¾	— ½
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	48	50	86	87	— ½
Stewart-Warner Speed. Corp. pfd	101	104	108	..	..
Studebaker Corp. com	44⅝	45	140	142	—6
Studebaker Corp. pfd	92	94¾	109	111	..
Swinehart Tire & Rubber Co	73	75	88	89	+ ½
Texas Co.	126½	127½	202	204	—5½
U. S. Rubber Co. com	54	54½	50½	51½	—1¼
U. S. Rubber Co. pfd	100½	102	107	107½	+1
Vacuum Oil Co	184	186	227	232	—1
White Motor Co. (new)	..	..	49	49½	— ¾
Willys-Overland Co. com	93	95	209	211	+1
Willys-Overland Co. pfd	95	96	104	106	..

*Par value $10. †And accrued dividend.

Factory Miscellany

Oakes to Add—The Oakes Co., manufacturer of automobile parts, will enlarge its plant at Indianapolis, Ind.

Hamilton Carbureter to Add—The Hamilton Carbureter Co., 535 Queen Street, East Toronto, Ont., will build an addition to its factory at Toronto.

Ford Plant in Pocatello—The Ford Automobile Co., Detroit, Mich., it is stated, is contemplating the construction of an assembling plant at Pocatello, Idaho.

Carhart to Build—The Carhart Motor Co., 218 West First Street, Oklahoma, Okla., contemplates the construction of a plant at an estimated cost of $50,000.

Glidden Varnish to Add—The Glidden Varnish Co. will erect a $20,000 steel, four-story manufacturing and storage building at 11,020 Madison Avenue, Cleveland, Ohio.

Hamilton Watch to Make Speedometers—The Hamilton Watch Co., Lancaster, Pa., will construct an addition to its plant for the manufacture of speedometers. C. F. Miller is president.

Canton Automobile Co. to Add—The Canton Motor Car Co., Canton, Ohio, has placed contracts for the erection of a new plant. It will be a two-story brick and steel structure, 66 by 200 ft.

Steel Products to Add—The Steel Products Co. has purchased a tract of land adjoining its plant at 2206 Clarkwood Road, Cleveland, Ohio. The land will be used for an addition.

North American Co. Gets Foreign Order—The North American Motor Co., Pottstown, Pa., has made an initial shipment of its motor trucks to Manchester, England. This company has been recently established.

Prudden to Add—Plans have been prepared for the construction of a two-story, 70 by 540-ft. addition to the plant of W. K. Prudden & Co., manufacturer of automobile wheels at Lansing, Mich.

Belknap to Enlarge—Belknap Wagon Co. will practically double its plant on Front Avenue, Grand Rapids, Mich. The company makes automobile bodies especially for delivery purposes. It now has orders on the books for more than 250 special bodies.

Auto Devices Move—The Auto Devices Co., manufacturer of Pamco shock absorbers and several other automobile specialties, has removed from 3027 Locust Street to a larger building at 3214 Locust Street, St. Louis, Mo., and with enlarged manufacturing facilities will largely increase its output.

Bettendorf Trailer Co. Formed—The Bettendorf Trailer Co., Bettendorf, Iowa, has been incorporated with a capital of $100,000. The company has been manufacturing automobile trailers at Bettendorf for several months, and in the spring will erect a shop building, 300 by 300 ft. J. W. Bettendorf is president.

R & R Shock Absorber Adds—The R & R Shock Absorber Co., Elgin, Ill., has been compelled to increase the force of employees by twenty-five men to take care of an order for 25,000 sets of its product of 100,000 single absorbers. As soon as the material can be secured the company can turn out 2500 sets per week. An addition to the plant is contemplated.

First Rock Island Tractor—The first tractor completed since the Heider Company of Carroll, Iowa, consolidated with the Rock Island Plow Co., Rock Island, Ill., was turned out this week. For several years the Rock Island company has been marketing the Heider product, and when the demand became so great that additional facilities were required it was decided to consolidate, shipping facilities being improved by the change, together with many other advantages. It is hoped to turn out several thousand of the machines this year.

The Automobile Calendar

Feb. 28-March 3	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 28-March 4	Utica, N. Y., Show, Utica, Automobile Bldg., Utica Automobile Trade Assn.
Feb. 28-March 4	Cedar Rapids, Ia., Show, Cedar Rapids Automobile Dealers' Assn.
Feb. 28-March 4	Paterson, N. J., Fifth Annual Show, Auditorium.
Feb. 28-March 4	Shamokin, Pa., Show, Shamokin Automobile Show Assn.
Feb. 29-March 2	Dallas, Tex., Second Annual Show, Dallas Automobile Accessory Dealers' Assn.
Feb. 29-March 4	Ft. Dodge, Iowa, Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March	Danville, Ill., Show.
March 5	Los Angeles, Cal., Speedway Race, Ascot Speedway Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
March 8-11	Davenport, Iowa, Show, Tri-City Davenport, Rock Island & Moline; Tri-City Automobile Trade Assn.
March 8-11	Mason City, Iowa, Show, Armory.
March 8-15	Brooklyn, N. Y., Show, Brooklyn Motor Dealers' Assn.
March 9-11	Kenosha, Wis., Show, Kenosha Retail Assn., Kenosha Farmers' Session.
March 11-18	Boston Automobile Show, Mechanics Bldg.
March 14-17	Springfield, Ill., Show.
March 15-18	Trenton, N. J., Show, Armory, under auspices of Chamber of Commerce.
March 18-25	Pittsburgh, Pa., Twelfth Annual Show, Automobile Dealers' Assn., Motor Square Garden.
March 20-25	Twin Falls, Ida., Show, Oliver Tabernacle.
March 21-25	Deadwood, S. D., Show, Auditorium. Deadwood Business Club.
March 22-25	Lexington, Ky., Show, Woodland Auditorium.
March 25-Apr. 1	Wheeling, W. Va., Show, Market Auditorium.
March 27-Apr. 1	Danville, Ill., Show, Eastern Illinois Dealers.
March 27-Apr. 1	Zanesville, Ohio, First Annual Southeastern Show, Airdome.
March 28-April 3	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
April 1-8	Butte, Mont., Home Industry Electric & Auto Show, Holland Arena, H. W. West, Mgr.
April 8	Corona, Cal., Race.
April 10-15	Seattle, Wash., Show, Arena.
April 15	Altoona, Pa., Pennsylvania State Motor Federation.
Apr. 26-May 6	Oakland, Cal., First Annual Pacific Coast Motor Power & Automobile Show, Automobile Industries Assn.
May	Chicago, Ill., Speedway Race for Amateurs, Speedway Park Assn.
May 6	Sioux City, Ia., Speedway Race, Sioux City Speedway Assn.
May 13	New York City, Sheepshead Bay Speedway Race.
May 26-27	Del Monte, Cal., Meeting, Three Divisions of National Assn. of Automobile Accessory Jobbers.
May 30	Tacoma, Wash., 100-Mile Speedway Race, Tacoma Speedway Assn.
May 30	Indianapolis Speedway Race.
May 31	Minneapolis, Minn., Speedway Race.
June 10	Chicago Speedway Race.
June 28	Des Moines, Iowa, Speedway Race.
July 2-6	Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
July 4	Tacoma, Wash., Speedway Race, Tacoma Speedway Assn.
July 4	Coeur D'Alene, Idaho, Race Meet, Hilles-Riegel.
July 4	Minneapolis 300-Mile Speedway Race.
July 4	Sioux City Speedway Race.
July 15	Omaha, Neb., Speedway Race.
Aug. 5	Tacoma Speedway Race, Tacoma Speedway Assn.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Speedway Race.
Sept. 4	Indianapolis Speedway Race.
Sept. 16	Providence Speedway Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Speedway Race.
Oct. 14	Chicago Speedway Race.
Oct. 19	Indianapolis, Ind., Race, Indianapolis Motor Speedway.

The Week in  the Industry

Harris Gray & Davis Sales Manager—R. W. Harris has recently been appointed sales manager of Gray & Davis, Inc., Boston, Mass. Mr. Harris was formerly in charge of the Ford system department of the company.

Stone Makes Remy Change—G. B. Stone has been placed in charge of the Ohio-Indiana territory of the Remy Electric Co., Anderson, Ind. For a number of years Mr. Stone has been a member of the engineering department of the Remy company, doing specialized sales work in connection with engineering.

Farrington Joins Gibson Co.—Richard Farrington has been appointed assistant to H. R. Williams, manager of sales of the Gibson Co., Indianapolis, and will have charge of advertising. Mr. Farrington comes to his new position well equipped, as in addition to having been editor of the Automoble Department of the *Indianapolis Star* for sometime past, he was previously connected with an advertising agency, and also with newspapers in other cities.

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Dealers

Ahlberg Opens Atlanta Branch—The Ahlberg Bearing Co. has opened a branch in Atlanta, Ga., at 323 Peachtree Street. This branch will be in charge of H. A. Fisher.

Cleveland Co. Builds—The Hudson-Stuyvesant Motor Co., Cleveland, Ohio, is building a $55,000 salesroom and service station. The building is on automobile row on Euclid Avenue and Twenty-first Street. The building, 50 ft. wide by 179 ft. deep, serves two purposes. The front section, 51 ft. deep, is an artistic commercial building, four stories high, of strictly fireproof construction.

Louisville Items—The Louisville Automobile Exchange, 544 South Third Street, agents for the Mitchell, Hollier and Partin-Palmer, have been appointed Chevrolet distributor in this territory.

The Standard Auto Co., 212 East Broadway, Louisville, agent for the Cole and Reo, is the new distributor for the Paige in this vicinity.

G. M. Cheschier of this city, who for two years has been Southern district manager of the Waverly Electric Co., with headquarters at Washington, D. C., has resigned to become district manager of Northwestern territory for the Milburn Wagon Co., Toledo, Ohio. He will make Minneapolis his new headquarters. For several years he was connected with the Southern Motors Co., Louisville.

Motor Men in New Roles

Collins Resigns—B. J. Collins, sales manager of the American Top Co., Jackson, Mich., has resigned.

Ryan Leaves Hupp—John Ryan, traveling representative of the Hupp Motor Car Co., Detroit, has resigned.

Pietsch Packard Mgr.—F. H. Pietsch has been appointed manager of the truck department of the Packard Motor Car Co., Chicago, Ill.

Suhr Promoted—F. W. Suhr has been appointed manager of the New York City motor tire department of the Firestone and Rubber Co.

Durie with Chase Truck—C. A. Durie has been made factory production manager by the Chase Motor Truck Co., Syracuse, N. Y. He succeeds J. E. Gramlich.

Kromer Transferred to Atlanta—P. W. Kromer has been transferred to the Atlanta, Ga., office of the Prest-O-Lite Co., Indianapolis, Ind. He was formerly with the Buffalo office.

Replogle Marathon Middle West Mgr.—H. H. Replogle is Middle West division manager of the Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio. His headquarters are in Omaha, Neb.

Moore Cleveland Velie Sales Mgr.—R. L. Moore, who has for a number of years been intimately connected with the motor car business in Cleveland, Ohio, has become sales manager of the Cleveland Velie Co.

Kerr Joins Overland Forces—Melvin Kerr, formerly assistant branch manager of the King Motor Car Co., New York City, has been appointed western New York representative of the Willys-Overland Co. His headquarters will be in Rochester.

Redman Joins Chicago Michelin—J. E. Redman has been made assistant sales manager of the Chicago territory by the Michelin Tire Co., Milltown, N. J. R. B. Tracy, who was appointed factory representative recently, will continue to supervise the Middle West branches of the company.

Langmaid Resigns—Chase Langmaid, manager of the New England branch of the Federal Tire Co. for some years, resigned last week to become sales manager of the Needham Tire Co. He is succeeded by W. H. Piggott, who was sent on from the factory at Milwaukee. H. L. Diechert has been sent on also as New England traveling representative.

Crumley Detroiter Sales Representative—A. A. Crumley has been appointed traveling sales representative of the Detroiter Motor Car Co., located in Detroit, Mich.

Ross Joins Dodge—Frank Ross, for the past five years superintendent of the Cleveland Foundry Co., Cleveland, Ohio, has accepted the position of superintendent of the compressed steel division of the Dodge Bros. factory located at Detroit.

Richards Goes to Pittsburgh—G. A. Richards, who has been manager of the Columbus branch of the Firestone Tire & Rubber Co., for three years, has been promoted to manager of the Pittsburgh branch of the company.

Hanson Joins Service Truck—A. B. Hanson, formerly manager of the service department of the Chalmers Motor Co., Detroit, has become general manager of the Service Motor Truck Co., Wabash, Ind.

Wellman Olds Advertising Manager—Fred Wellman has been appointed advertising manager of the Olds Motor Works, Lansing, Mich. He was formerly confidential assistant and advertising counsel to Carl G. Fisher in the Indianapolis and other enterprises. C. V. McGuire, former advertising manager of the Olds, has joined the Cheltenham Advertising Agency.

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Dealers

New Dayton Rubber Dealers—The Alling Rubber Co., Albany, N. Y., and the Dayton Tire Co., Boston, Mass., have been appointed dealers for the tires of the Dayton Rubber Mfg. Co., Dayton, Ohio.

Cleveland Items—The Ris Motor Co., Cleveland, has taken on the Kissel-Kar in addition to the Dort, which was its original line.

W. J. Newcomb, Cleveland, Ohio, has purchased the business and stock of the Windermere-Euclid Garage Co. and taken over the lease of the building at 13,560 Euclid Avenue. Mr. Newcomb was formerly connected with the Baker-R & L Co., but will now devote his entire time to the new business.

The Coate Motor Car Co., Cleveland, distributor of the Paige and Pullman, is remodeling and enlarging its salesroom. A service station has been established at Euclid Avenue and East 66th Street, in order to give more room for the sales department.

Columbus Items—The Capital Motor Car Co., 168 North Fourth Street, Columbus, has decided to move to South Fourth Street, where a two-story garage and sales rooms will be erected by the concern. The new structure will be erected during the summer.

The Winders Motor Sales Co., Columbus and central Ohio representatives of the Chevrolet, Velie and Monroe, has decided to erect a modern sales room on East Long Street, near Fourth Street, which will cost approximately $25,000.

Wis. News Items—O. F. Fischedick, who, with J. D. Babcock established the first exclusive motor supply and accessory store in Milwaukee by organizing the Auto Supply Co. in 1910, has disposed of his interest to Mr. Babcock, who becomes president and general manager. Mr. Fischedick will engage in another department of the industry. The Auto Supply Co.'s main store is located at 134-136 Second Street, Milwaukee.

The Diener-Nelson Co., Milwaukee, State distributor of the Haynes and Grant, has moved from 809 Grand Avenue to new and larger quarters at 188-192 Eighth Street, Milwaukee.

The American Tire & Rubber Co., 252 Fifth Street, Milwaukee, has been appointed State distributer of Batavia tires.

The Jeffery Motor Service Co., Fond du Lac, has leased the entire first and part of the second floor of the Longdin-Bruegger Block and is converting it into a modern garage and service station. It will be ready May 1.

E. A. Glab and J. J. Glab of Milwaukee have organized the Pathfinder Sales Co., to act as distributer of the Pathfinder in Wisconsin and upper Michigan. Headquarters have been established at 163-165 Eleventh Street, Milwaukee.

The Motor Car Sales Co. of Milwaukee has been organized to act as Wisconsin distributer of Marmon cars. Temporary headquarters have been established at 136 Mason Street, pending the completion of the company's own garage, which will be located in the downtown district. The concern also is Milwaukee agent for the Oakland line. F. P. Lynch and P. B. Hustis are in charge of sales and George Kerner manager of the service department.

The Universal Auto Supply Co., organized recently as a corporation in Milwaukee, has opened a store and service station at 468 Jefferson Street.

The Anderson Electric Car Co., Detroit, Mich., has established a direct factory branch at Milwaukee, in charge of J. A. Crandall. Headquarters have been opened at 604 Downer Avenue. Mr. Crandall was formerly associated with the Detroit electric branch in Chicago.

San Francisco News Items—The Latham Davis Co., San Francisco, has been appointed Northern California agent of the Case Car, which it will handle in addition to its Stutz and Fiat lines.

M. M. Hartmann of the Hartmann Motor Sales Co., who was recently appointed Pacific Coast distributor of the Lozier car has named William Sealey as manager of his San Francisco office.

G. K. Arnold and J. H. Stelling, formerly of New York, have been appointed Pacific Coast agents of the Simplex-Crane. Mr. Arnold was formerly connected with the Packard and S. G. V. agencies in New York City and Stelling was identified with the De Dion Bouton Co. In addition to the Simplex-Crane car the new firm will handle the Lancia in this territory.

With the arrival in San Francisco of Eli White, chief construction engineer of the Hood Co. of Detroit, last week the first step in the building of the million-dollar Chevrolet assembling plant in Oakland was started. The new plant will furnish close to 150,000 ft. of floor-space and will be so built as to allow the putting together of 8000 Chevrolet cars a year. It is anticipated the factory will be in working order by July 1. The location of the plant is right on the Lincoln Highway in Oakland.

Many Agencies Being Closed at Boston—The activity in Boston motor circles is evident from the way agencies are being placed without waiting for the motor show. J. W. Bowman has closed up to represent the Daniels Eight. He also has the Velie. W. B. Dorr and A. J. Griffen have formed the Dorr-Griffen Co. to handle the Crow-Elkart, with salesrooms on Commonwealth Avenue. F. L. Brown, New England distributor of the Apperson, has formed a new company to handle the line at retail in Boston, with R. W. Shank and J. G. MacMurray, two former Buick salesmen, as partners and they have leased the old Dodge Bros. quarters on Boylston Street. B. W. Krogman and E. J. Sullivan have formed the S. J. R. Motor Sales Co. to handle the new S. J. R. Boulevard roadster being made at Boston, they having taken Maine, New Hampshire and Vermont. G. D. Rathburn of Malden has taken the agency for the Elcar, and he will open salesrooms in Boston shortly. And A. C. White, Jr., resigned recently to take on the Vim truck for New England. W. L. Burgess, sales manager for the Dorris, was in Boston last week and he expects to close an agency shortly and J. W. Moon has plans developing to have his car represented. V. A. Charles, New England distributor for the Briscoe, has given up the retail sales, and it is to be taken over by the Porter Motor Sales Co., handling the Pathfinder.

Gardner Machine to Add—The Gardner Machine Co., Beloit, Wis., manufacturing disc grinders widely used in automobile factories, garages and other shops, has made plans for an addition of the same size as the one now being completed. Both buildings will be 60 by 60 ft. The company's business has increased enormously in the last 8 months, making enlargement imperative. The establishment of many garages and repairshops throughout the country has created a heavy demand for small grinders. The C. H. Besly Co., Chicago, which has works at Beloit, is also enlarging the new shop recently completed.

Tower Truck Co. Formed—The R. J. Tower Motor Truck Co. has been formed at Greenville, Mich., with a capital stock of $50,000. A truck with several new features and a novel system of traction will be manufactured. R. J. Tower is president of the company, Francis Tower, vice-president, and C. V. Coats, secretary and treasurer. Besides the officers T. B. Winter and H. L. Baker are stockholders. Factory buildings have been secured and the manufacture of trucks will start at once.

Parish & Bingham to Add—The Parish & Bingham Co., Cleveland, Ohio, has secured a permit to erect a fireproof addition to its factory building at 10,601 West Madison Avenue. The building will be 900 ft. by 100 ft., with a height varying from 20 to 30 ft. At the same time it asked permission to build an addition to its boiler room. The two will cost about $130,000. Several other modern buildings have been planned by the company.

Kissel to Build Again—Plans for the proposed new factory building to be erected by the Kissel Motor Car Co., Hartford, Wis., on the 17-acre tract recently acquired for future extensions, are being drawn. It is said that work will be undertaken before June 1. The company is completing a large shop addition at this time.

Highway Tire Protectors' Separate Plant—John J. Bukolt, who has been manufacturing Highway tire protectors in connection with his other business, the Automatic Cradle Mfg. Co., at Stevens Point, Wis., will separate the two industries. A $100,000 corporation will be formed to take over the tire appliance and accessory business, and a new fireproof factory affording 15,000 ft. of floor-space will be erected. The present combined works are employing nearly 200 men on two 10-hr. shifts, and more than $3,500 worth of new machinery and tools has been contracted for to relieve the high tension caused by the extraordinary demand.

Steel Clad Auto Bow Co. to Start—The Steel Clad Auto Bow Co., Holland, Mich., has been organized here, its capital stock being $50,000. H. R. Schnarr is president, Henry Winter secretary, and Dick Jellema vice-president and treasurer. The old Holland Mfg. Co.'s plant will be occupied by the new concern.